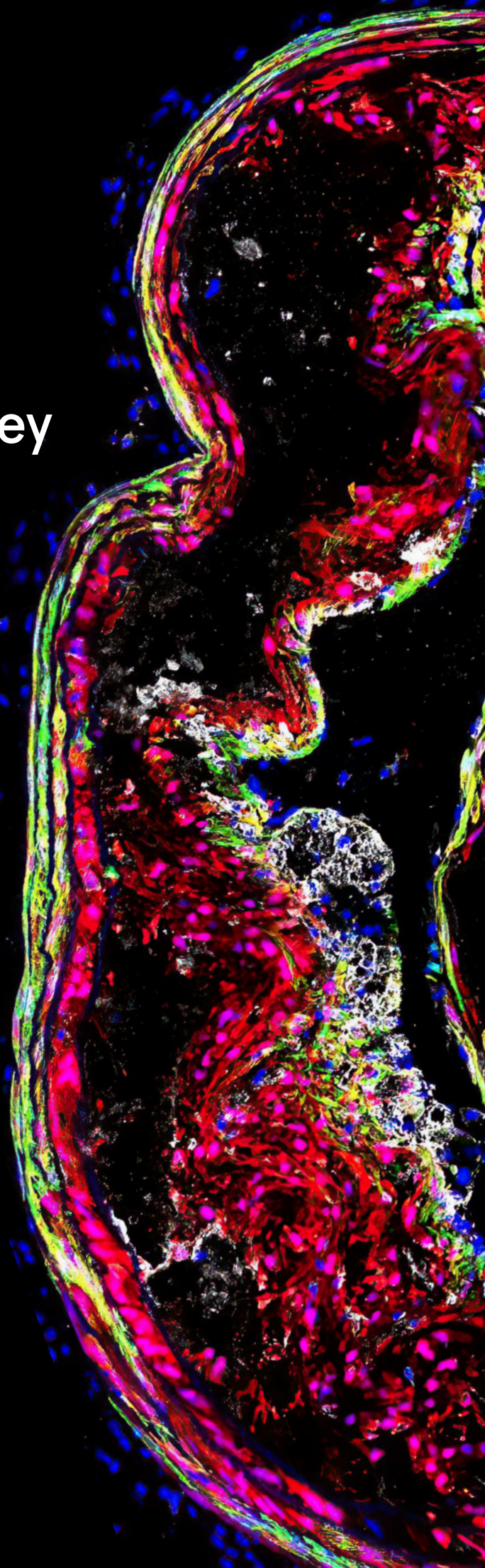




THE UNIVERSITY OF  
**SYDNEY**

# The University of Sydney Nano Institute

Annual Report 2022



We acknowledge the tradition of custodianship and law of the Country on which the University of Sydney campuses stand. We pay our respects to those who have cared and continue to care for Country.

Cover image: Nanoscale immunofluorescence staining image showing proteins in a mouse atherosclerotic artery.  
Image credit: Weizhen (Eva) Li.

# The University of Sydney Nano Institute

Annual Report 2022

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“The approach to research at Sydney Nano is underpinned by collaboration and multidisciplinary partnerships, both within the University and with external academic or industry partners.”

**Professor Emma Johnston AO FAA FTSE**  
Deputy Vice-Chancellor Research, The University of Sydney.

# Preface



Sydney Nano is committed to driving cutting-edge research that addresses some of the most pressing challenges facing our planet today, and I continue to be impressed by the transformational impact the Institute brings to the University and the broader community. The approach to research at Sydney Nano is underpinned by collaboration and multidisciplinary partnerships, both within the University and with external academic or industry partners. It is through these partnerships that our expertise and experience can be combined to develop innovative approaches to the grand challenges facing our society.

Sydney Nano's clear commitment to solving complex issues surrounding sustainability, health, and energy are evident in their array of research programs, particularly the Grand Challenges. These research programs foster strong collaborations across the university, placing Sydney Nano as an exemplar institute within our ecosystem of multidisciplinary institutes. Sydney Nano embodies the spirit of the University of Sydney's 2032 Strategy, both in creating a better place to work and a place that works better and where our research is excellent, tackles the greatest challenges, and contributes to the common good.

In particular, I am excited by the work of the Smart Sustainable Building and NanoHealth networks that are bringing together multidisciplinary researchers from across the University with industry, government, partner organisations, and end-users with an aim of delivering sustainable real-world solutions to global challenges using nanoscience and nanotechnology. In 2023 and beyond, the NanoHealth network will focus on delivering sustainable real-world solutions to the growing health challenges that are exacerbated by climate change, while simultaneously examining the role that the health care sector plays in contributing to global greenhouse emissions. These networks align with the United Nation's Sustainable Development Goals, the University's 2032 Strategy and also COP26 initiatives; demonstrating their potential for global significance and impact.

Finally, I would like to thank Professor Ben Eggleton, the outgoing Director of Sydney Nano, for his outstanding leadership of Sydney Nano over the last five years. Ben's talents will continue to serve the University in his new role as Pro-Vice-Chancellor of Research, I look forward to working closely with Ben in this position. I would also like to warmly welcome Associate Professor Alice Motion as the Interim Director of Sydney Nano. I look forward to seeing the unique perspective and direction that Alice will bring to Sydney Nano initiatives while continuing to align with the University's strategy and the UN's Sustainable Development Goals.

**Professor Emma Johnston AO FAA FTSE FRSN**  
Deputy Vice-Chancellor Research, The University of Sydney

A portrait of Professor Ben Eggleton, a middle-aged man with grey hair and a beard, wearing a dark blue suit, white shirt, and patterned tie. He is holding a small, square microchip in his hands. The background is a laboratory setting with various pieces of equipment, cables, and a white metal frame.

“The collective expertise and dedication of our community, combined with our commitment to interdisciplinary collaboration, position Sydney Nano as a leader in addressing some of the world's most pressing challenges.”

Professor Ben Eggleton  
Director, The University of Sydney Nano Institute



## Director's note

As we reflect upon the past year, I am delighted to witness the return of in-person and hybrid events, where we can once again experience the vibrancy and energy of our community in three dimensions rather than confined to the limitations of a screen. The synergy and connections that come from face-to-face interactions are invaluable, and I am grateful for the opportunity to reconnect with all of you.

I would like to extend a warm welcome to Professor Emma Johnston, our new Deputy Vice-Chancellor Research, who joined us in July 2022. With her extensive experience and leadership in the Australian higher education and research sector, I am confident that Emma will enable significant contributions to the advancement of Sydney Nano and our pursuit of interdisciplinary excellence.

In 2022, Sydney Nano endorsed a total of 19 multidisciplinary research nodes within our four seed-funded research schemes, including the Grand Challenges, Kickstarters, Frontiers, and Catalysts. We launched four new Grand Challenges, each focused on addressing critical health and sustainability issues in alignment with the United Nations Sustainable Development Goals. These nodes have provided a platform for collaboration across disciplines, enabling us to tackle complex problems and make meaningful contributions to society. Additionally, we continued to expand our NanoHealth and Smart Sustainable Building Networks. This collaborative effort has engaged over 210 academics at all levels, fostering translational and transformative research.

Looking ahead, I am particularly excited about the establishment of NanoHealth 2.0 in 2023. Building upon the success of its predecessor, NanoHealth 2.0 will focus on specific health challenges that directly impact our local and global communities. In close consultation with academic and industry experts, we have identified the accelerating health challenges posed by climate change, as well as the role of the healthcare sector in contributing to global greenhouse emissions, as key areas of focus. By aligning with the COP26 Health programme's key initiatives, we aim to drive research, innovation, and policy changes that will positively impact the health of our planet and its inhabitants.

I would also like to express my sincere gratitude to Alice for graciously stepping into the Interim Director position during my transition to the role of Pro-Vice-Chancellor Research. Alice's dedication and commitment to Sydney Nano have been invaluable, and I am confident that her leadership will provide fresh perspectives and drive new initiatives, ensuring that Sydney Nano remains at the forefront of ground-breaking research and innovation.

As we move forward into 2023, I am filled with optimism and excitement for the opportunities that lie ahead. The collective expertise and dedication of our community, combined with our commitment to interdisciplinary collaboration, position Sydney Nano as a leader in addressing some of the world's most pressing challenges. I am honoured to be part of this incredible journey, and I look forward to witnessing the continued growth and impact of Sydney Nano in the years to come.

**Professor Ben Eggleton**  
Director, The University of Sydney Nano Institute

# About the Institute

At Sydney Nano, we like to say that the next giant leap is seriously small. Revolutionary changes in science and technology have opened access to the nanoscale and together we are tackling some of the most challenging problems faced by humanity. With combined expertise from across the University's disciplines and access to purpose-built facilities, our research is taking nanoscience to new levels.

As a multidisciplinary institute, we foster and enable research and education across all faculties to develop innovative solutions to some of the world's greatest challenges. By connecting scientists and engineers to researchers in humanities, law, and the social sciences, we can create translational and transformative solutions, together.

Our mission remains to transform our economy, society, and everyday life through multidisciplinary research in nanoscale science and technology.

With global significance, our research in 2022 addressed priorities outlined by the UN Sustainable Development Goals, with a strong focus on goals 3, 9, 12, and 17. Additionally, we continue to address the World Health Organisation Priorities as well as the Australian Research Priorities. Importantly, this work spans key focus

industries, such as manufacturing, energy and the environment, medicine and health, communications, computing, and security.

Through our education, training, and external engagement programs, we are inspiring the next generation of researchers. Together we are tackling some of the most challenging problems facing humanity: creating new nanomaterials for renewable energy; developing sensing technologies to improve public biosecurity; designing the next generation of self-sufficient buildings; and developing nanoscale devices to detect health problems at an early stage. The impact of this technology will be felt far beyond science, medicine, and engineering. That is why we are reaching across our academic community into the arts and social sciences, business, law, architecture, and design.

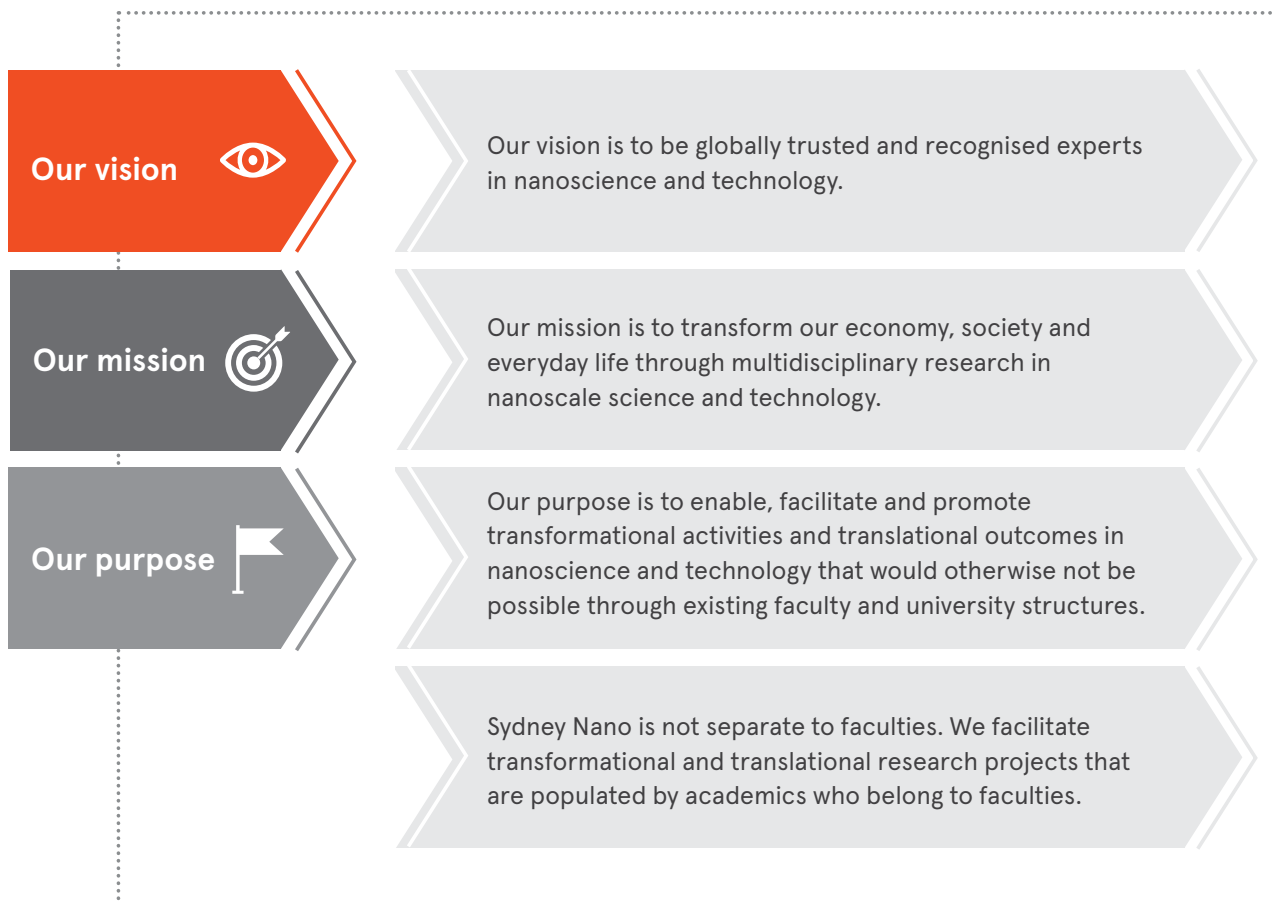




We work horizontally across the University and in close partnership with all faculties and schools to achieve transformational and translational outcomes supported by six strategic activity fields. Each of these fields are linked to our academic framework and continue to support our Grand Challenge projects, the Kickstarters, Frontiers, and Catalysts, as well as our two Networks.

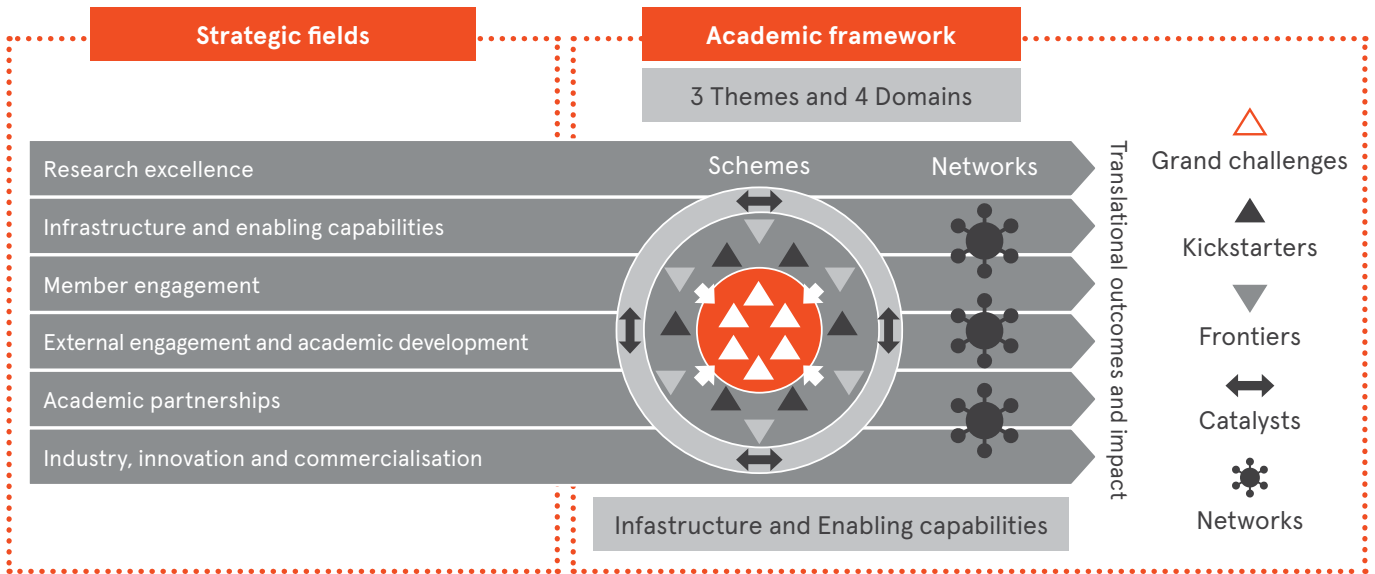
Our strategic fields are:

- Research excellence
- Member engagement
- External engagement and academic development
- Academic partnerships
- Industry, innovation and commercialisation
- Infrastructure and enabling capabilities



## Strategic Fields and Academic Framework

Sydney Nano works horizontally across the University and in close partnership with all faculties and schools to achieve transformational and translational outcomes. Our strategy is anchored in six strategic fields.



Each of these fields are linked to our academic framework which is structured in four complementary research schemes and the newly launched Networks.

Our research activities are based on three themes and four domains and are underpinned by world-class infrastructure and capability platforms.

### Themes

- Manufacturing, energy, and environment
- Health and medicine
- Communication, computing, and security

### Domains

- Quantum science
- Nanophotonics
- Materials on the nanoscale
- Molecular nanoscience

What we achieve we achieve together – with our Members, our academic partners and our industry collaborators.



“The next  
giant leap is  
seriously small.”

# Our People

## Sydney Nano Executive Committee

The Sydney Nano Executive Committee, chaired by the Director, Ben Eggleton, comprises the Chief Operating Officer and five Deputy Directors, who work as a team to affect our academic, strategic, and financial goals.



**Professor Ben Eggleton**  
Director



**Dr Gunther Schmidt**  
Chief Operating Officer



**Associate Professor Alice Motion**  
Deputy Director,  
External Engagement and  
Academic Development



**Associate Professor Girish Lakhwani**  
Deputy Director,  
Academic Partnerships



**Associate Professor Yixiang Gan**  
Deputy Director,  
Member Engagement



**Professor Stephanie Watson**  
Deputy Co-Director,  
Industry, Innovation and  
Commercialisation



**Professor Ali Abbas**  
Deputy Co-Director,  
Industry, Innovation and  
Commercialisation

## Early Career Research Ambassadors

The Early Career Research (ECR) Ambassadors are an integral part of the team. They represent Sydney Nano and support member engagement initiatives and activities at a faculty level, and via national and international networks including academic and social events. ECRAs ensure the integration and alignment of Sydney Nano across their Faculty/University School to meet the research and education strategies of Sydney Nano and the University.

In 2022, 11 ECR Ambassadors were nominated across seven faculties and university schools. Three of these ECR Ambassadors were appointed in 2022 with eight ECR Ambassadors continuing their roles from 2021. These ECR Ambassadors support Deputy Director Associate Professor Yixiang Gan in the Member Engagement portfolio.



**Dr Caitlin Johnston**  
Faculty of Medicine  
and Health



**Dr Livia Salvati Manni**  
Faculty of Science



**Dr Yi Shen**  
Faculty of Engineering



**Dr Jarryd Daymond**  
The University of Sydney  
Business School



**Dr Moritz Merklein**  
Faculty of Science



**Dr Anastasia Globa**  
School of Architecture,  
Design and Planning



**Dr Daniel Yeadon**  
Sydney Conservatorium  
of Music



**Dr Nicholas Hunt**  
Faculty of Medicine  
and Health



**Dr Helena Robinson**  
Faculty of Arts and  
Social Sciences



**Dr Fred Marlton**  
Faculty of Science



**Dr Anusha Withana**  
Faculty of Engineering

## Sydney Nano Student Ambassadors

The six Sydney Nano Student Ambassadors that were appointed in 2021 continued in their roles in 2022. Mentored by the ongoing Deputy Director for External Engagement and Academic Development, Associate Professor Alice Motion, the student ambassadors developed their skills in research communication, leadership, and project management.



**Laura Haidar**  
School of Physics



**Bryce Mullens**  
School of Chemistry



**Karuna Skipper**  
School of Chemistry



**Jed Austin**  
The University of Sydney  
Business School



**Queenie Yip**  
School of Biomedical  
Engineering



**Timothy Newman**  
School of Physics

## Sydney Nano International Ambassadors

In 2022, Sydney Nano appointed four International Ambassadors to act as the key contacts for academic institutions in their designated region. One International Ambassadors was appointed in 2022 with three International Ambassadors continuing their roles from 2021. These Ambassadors work closely with the Deputy Director for Academic Partnerships, Associate Professor Girish Lakhwani, to develop our academic partnership strategy and strengthen our international collaborations.



**Associate Professor  
Asaph Widmer-Cooper**  
North America Ambassador  
Faculty of Science



**Dr Feng Li**  
China Ambassador  
Faculty of Science



**Associate Professor  
Alejandro Montoya**  
Emerging Regions Ambassador  
Faculty of Engineering



**Associate Professor  
Markus Muellner**  
Europe Ambassador  
Faculty of Science

## Sydney Nano Administrative Support Unit

The Sydney Nano Administrative Support Unit provides administrative and operational support to the Sydney Nano Directorate.



**Trudy Fernan**  
Executive Officer



**Noella Lopez**  
Executive Assistant



**Gerard Minogue**  
Senior Project Officer  
– SNH Operations



**Rhiagh Cleary**  
Senior Research Officer  
– NanoHealth



**Dr Moein Seyfour**  
Senior Research Officer  
– Science and Engineering



**Dr Claire Flitcroft**  
Project Officer  
– Communications



**Terance Pereira**  
Project Officer – Digitisation  
and Data Management



**Leesa L'Episcopo**  
Project Administrator

## Our members

Our membership now consists of **over 1100** academic and professional staff from all faculties and service units. A unique group of people from different backgrounds and disciplines, we all share an interest and passion for nanoscience. We love working in multidisciplinary teams and creating translational and transformational outcomes that are only possible in the unique Sydney Nano environment.

### The Sydney Nano structure

- Our structure brings together over 1100 academic and professional staff from all faculties and service units.
- Members are conducting nano-related research at the University of Sydney.
- Participants are PhD students and postdocs working with Members.
- Both receive defined benefits including funding opportunities.
- Our community comprises academic and professional staff at the University who work with Sydney Nano or have a general interest in nanoscience and technology.
- We seek a wide and inclusive representation from all disciplines and a higher proportion of women than usual in STEM areas.



# 1105



Total number of University of Sydney staff engaged

17%  
Member

26%  
Participant

57%  
Community



# 190 Members lead nano research nodes as Chief Investigators

One third are **women**



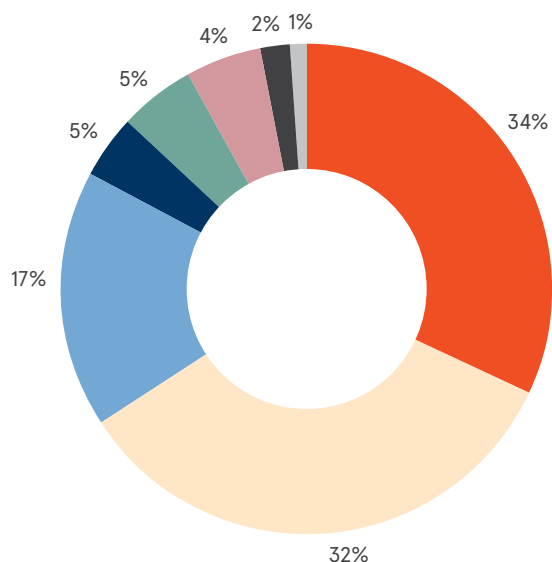
## Spread over all 8 Faculties and University Schools

44% Senior academics

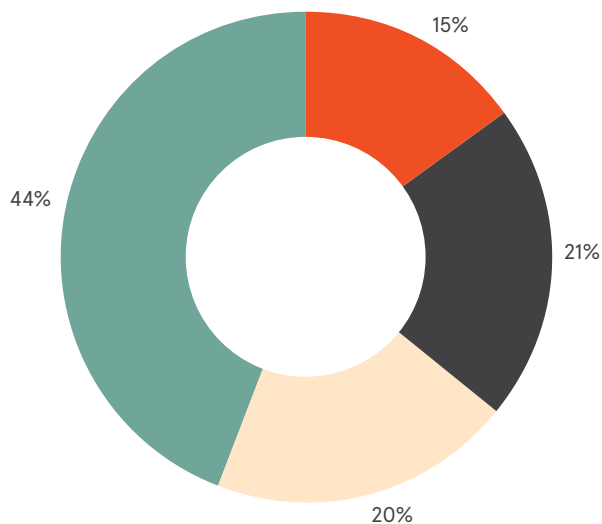
41% Mid-Career Researchers

15% Early-Career Researchers

Faculty



Academic level



- Engineering
- Architecture, Design and Planning
- Science
- Arts and Social Sciences
- Medicine and Health
- Sydney Conservatorium of Music
- Business
- Law

- Level B
- Level D
- Level C
- Level E

\*Data spread across 35 Schools

“Academics and students in the Faculty of Science have benefited immensely by engaging with Sydney Nano to accelerate their research. In particular, Sydney Nano has provided our early career researchers with incredible support through mentoring, boot camps, and opportunities to expand their collaboration networks.”

**Professor Stephen Bartlett**  
Associate Dean Research, Faculty of Science



# Strategic Fields

In 2022, we achieved significant progress in all six strategic fields.

## Research Excellence

We aim for excellence in translational and transformative research. Sydney Nano’s multidisciplinary schemes are selected by a governing body in a rigorous selection process, have a defined time frame of seed funding, and have ambitious key performance indicators. All 19 nodes across our four schemes made significant progress towards their missions and targets. Our research nodes provide great opportunities for multidisciplinary research, while presenting prospects for partnerships with industry, end-users, and other institutions around the world.

In 2022, Sydney Nano continued to expand a framework that fosters and enables cross-faculty collaborations and multidisciplinary research: Sydney Nano Networks. Networks form integrated large-scale research focus areas. Co-led by faculties, the focus is on faculty-research priorities, activating expertise across the University. In 2022, Sydney Nano held several Nanotechnology

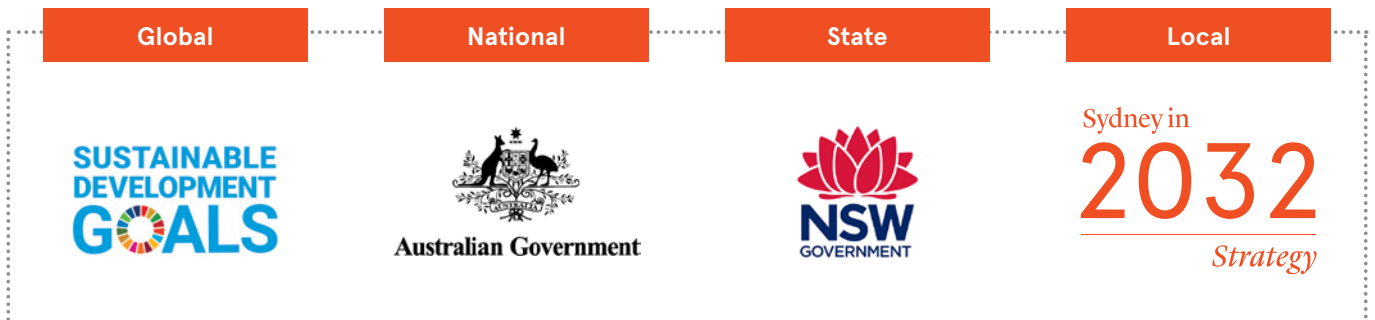
Innovation Workshops to facilitate constructive discussions surrounding key issues of health and sustainability across our two Networks; the NanoHealth Network and the Smart Sustainable Building Network.

Importantly, our academic framework embodies the core elements of the University of Sydney’s 2032 Strategy. That is, that our research is excellent, tackles the greatest challenges, and contributes to the common good. Additionally, all of the Sydney Nano schemes and networks are designed to target the United Nations’ Sustainable Development Goals, the Australian Government research priorities, and the NSW 20-year research & development roadmap, released in early 2022. In aligning with these priorities, Sydney Nano is well positioned to be a leader for multidisciplinary research in the global, national, and local contexts.

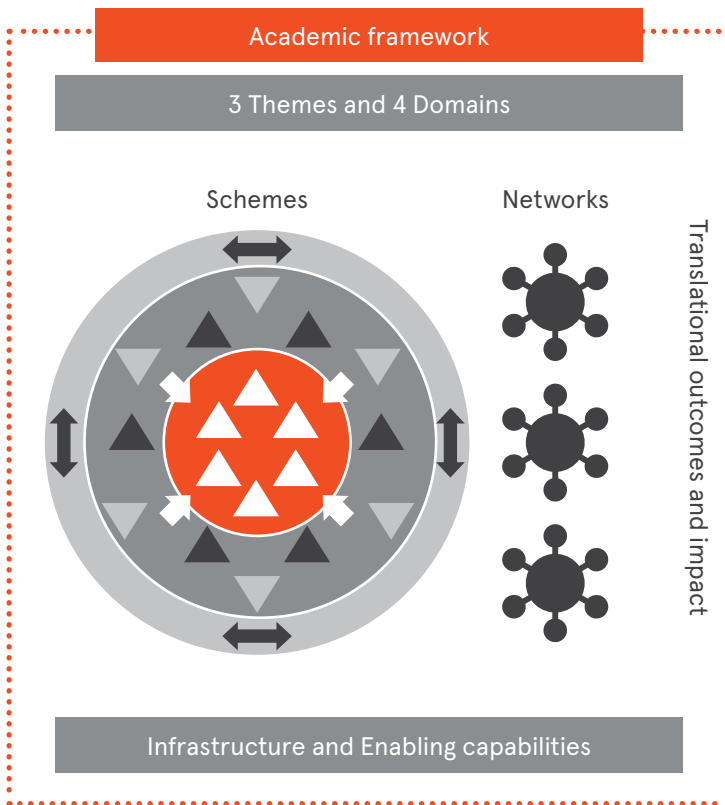


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**Nano Institute**



## Expanding the academic framework



### △ Grand challenges

flagships nodes that focus on finding multidisciplinary solutions for one grand challenge of our society or economy

### ▼ Frontiers

nodes that develop one technology platform in multidisciplinary applications with high potential of commercialisation

### ▲ Kickstarters

individual nodes of multidisciplinary research that could develop into grand challenges

### ↔ Catalysts

nodes led by social scientists that enhance and influence how we approach our programs and how they create impact

### ⚙ Networks

large scale integrated clusters of research expertise co-led by Sydney Nano and a faculty

## 19 Active research nodes:

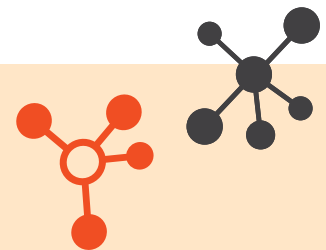
4 Grand Challenges

5 Catalysts

8 Kickstarters

2 Frontiers

Plus 2 Networks



**15** Records of invention associated with Sydney Nano



**210+** academics engaged in schemes and networks across all Faculties/University Schools



**1000+** citations

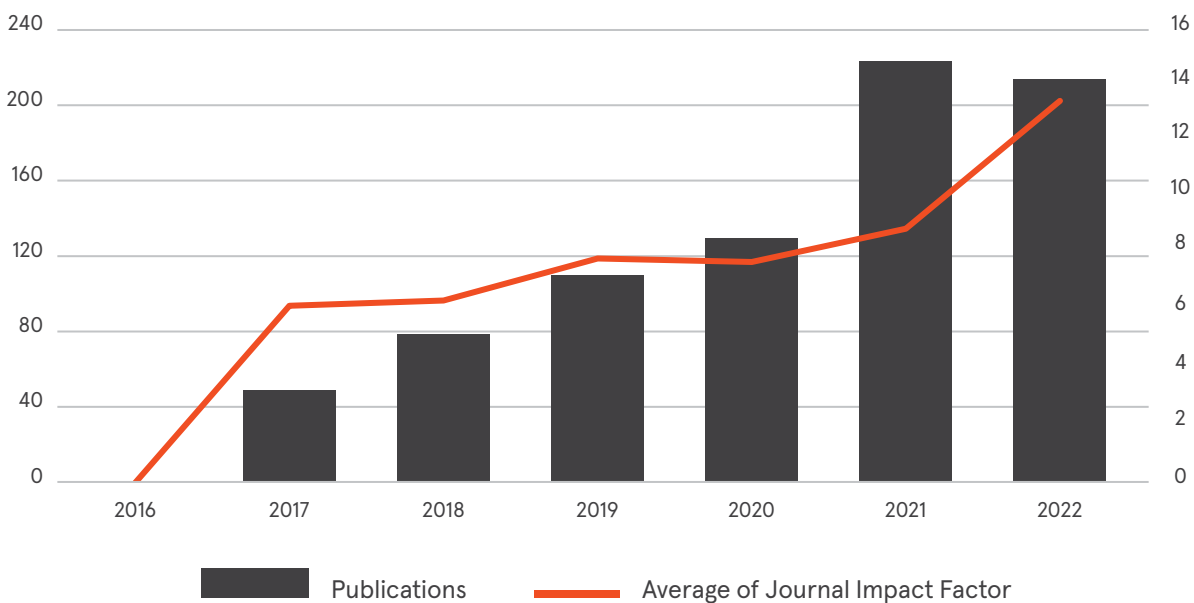


**\$19.6M**

in external revenue, including 54 grants

**214** affiliated publications

Average of Journal Impact Factor increased by **50%**



# Grand Challenges

In 2022, four new Grand Challenges were launched in the focus areas of health and sustainability, working to discover and develop ground-breaking solutions to the world's greatest challenges.

Our flagship Sydney Nano Grand Challenges are designed to support high-profile multidisciplinary research teams who collaborate on projects that address the most important problems of our society and economy and are vehicles for long-term funding and sustainability.



*“Our vision proposes a new generation of building envelopes that could give back, repair and restore the ecosystem they work within, a future where buildings will no longer be detrimental for the environment – but an active part of its restoration.”*

Dr Arianna Brambilla and Professor Deanna D'Alessandro  
Eco-Active Building Envelopes Grand Challenge

## Professor Deanna D'Alessandro and Dr Arianna Brambilla Eco-Active Building Envelopes

To lay the groundwork for a new generation of buildings that are self-sufficient in energy and water consumption, able to produce on-site food to encourage healthy eating habits and contribute to the regulation of heat stress and pollution.



Watch this two-minute video explaining our four Grand Challenges by scanning the QR code.





**Professor Corinne Caillaud  
and Professor Antonio Tricoli**

**Nanosensing Airborne Pathogens for Public Biosecurity**  
To develop disruptive nanoscale sensing technologies for detection of airborne pathogens to upgrade public biosecurity standards and regulations.



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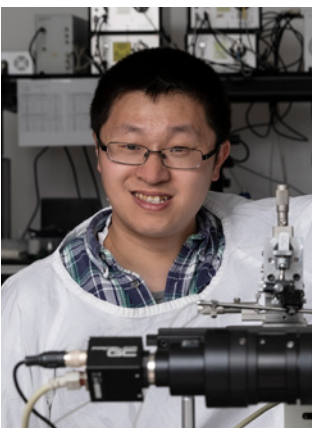
*“We are striving to harvest and utilise sunlight to meet our world’s increasing energy demand using Earth-abundant resources – without use of fossil fuels.”*

**Dr Fengwang Li and Professor Anita Ho-Baillie**  
Solar Fuels Grand Challenge

**Professor Anita Ho-Baillie and Dr Fengwang Li**

**Solar Fuels**

To create new nanomaterials and chemical processes that capture and ‘bottle’ sunlight in the form of energy-rich, renewable fuels.



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*“Sydney Nano’s support has been instrumental in bringing our vision to life and ensuring that our research continues to make a tangible impact in the field of organ-on-chip and mechanobiology.”*

**Associate Professor Arnold Lining Ju**  
Organ-on-Chip for Blood Clot assessment Grand Challenge

**Associate Professor Arnold Lining Ju and Dr Freda Passam**

**Organ-on-Chip for Blood Clot assessment**

To develop microfluidic devices based on vascular imaging of affected patients to detect thrombotic tendency in recipients of COVID-19 vaccine.

## Additional Research Schemes

### Kickstarters

The Kickstarter projects are precursors for Grand Challenges. They enable multidisciplinary research with a strong focus on humanitarian or environmental impact.



#### Sustainable and Healthier Societies through NanoTech

**Chief Investigators: Professor Alex Broom, Dr Katherine Kenny, Associate Professor Alice Motion**

Focusing on the nexus of nanotechnology and issues of sustainability and health, including both the possibilities of drawing on nanotech for improving health but also key constraints. In particular, exploring health as related to climate and environmental concerns.



#### NanoFab

**Chief Investigators: Dr Anastasia Globa, Dr Anusha Withana, Dr Phillip Gough, Dr Ali Hadigheh**

Developing innovative bio-inspired and sustainable living materials for applications in the building industry, packaging, forestry, farming, waste management, and upcycling.



#### 3D Nanoprinting

**Chief Investigators: Professor Hala Zreiqat, Dr Iman Roohani**

Addressing longstanding challenges in creating synthetic bone analogues that mimic the composition and hierarchal structure of bone tissue.



#### Hybrid nano-systems curing cancer spread

**Chief Investigators: Dr Pegah Varamini, Dr Behnam Akhavan**

Harnessing the power of nanotechnology to shift palliative care to preventative solutions for cancer spread via an interdisciplinary multimodal approach.

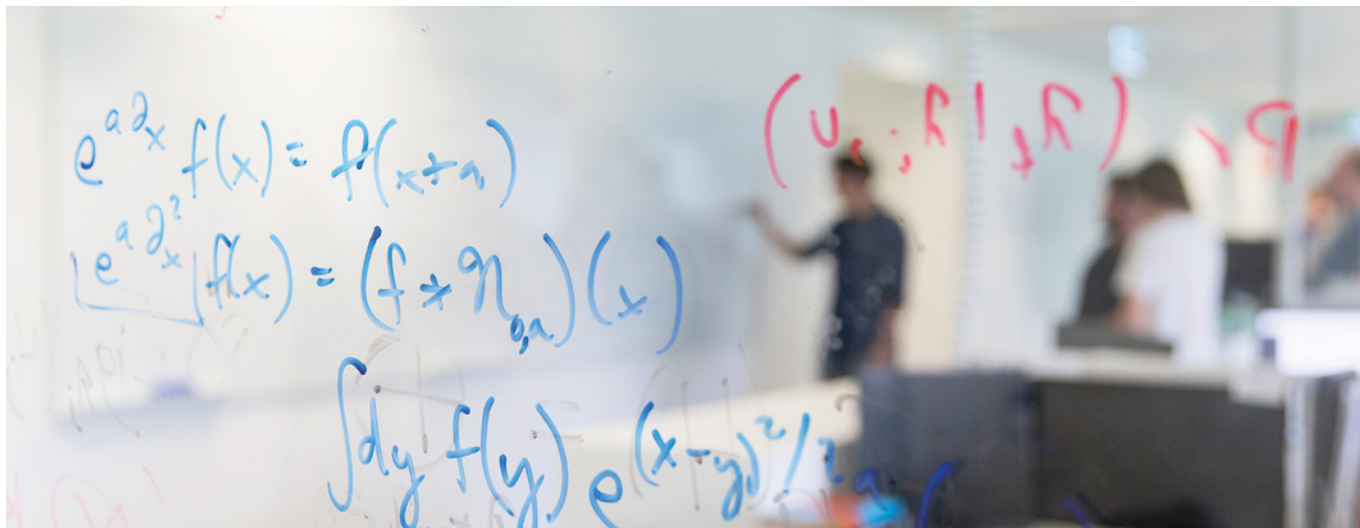


#### Nano In Sight

**Chief Investigators: Professor Stephanie Watson, Dr Yogambha Ramaswamy**

Employing novel bioengineering strategies to address a critical problem in regenerative medicine and stem cell therapeutics.





**Bacteriophage NanoRobots**

**Chief Investigator:**  
**Dr Hien Duong**

Combining science, engineering, and medicine to perform cutting-edge research using nanotechnology to develop smart phage nanorobots to fight resistant bacteria.



**NanoEnergised**

**Chief Investigator:**  
**Professor Ali Abbas**

Developing nano phase change materials (nanoPCMs) as a technology platform for a myriad of applications, starting with a focus on a high-efficiency heat battery device for nanoenergised applications in solar roof structures and biomedical wearable technology.



**Smart sensors for intelligent buildings**

**Chief Investigator:**  
**Associate Professor Daniel Dias-Da-Costa**

Developing an efficient, reliable sensing platform that continuously monitors the critical parameters of sustainable civil structures.

**Frontiers**

The Frontier scheme was designed to assess and develop one emerging technology platform in multiple applications to identify technology transfer opportunities over a diverse range of sectors.



**Breaking space-time barriers with nanosensors**

**Chief Investigators:** **Dr Amandeep Kaur**  
**and Professor Kate Jolliffe**

Addressing food security and health care by developing a molecular and nanotechnological approach to visualise and measure biological and biochemical events.



**NanoFluidics**

**Chief Investigators:** **Associate Professor Stefano Palomba**  
**and Dr Daniele Vigolo**

Identifying critical applications of Nanofluidics by conducting academic and industrial mapping in the areas of nanohealth and sensing.

## Catalysts

Catalyst projects encourage new ways of thinking about research. They aim to bring together social scientists, artists, and musicians with researchers from science, health, medicine, and engineering.



### Nano Technology - Economy - Society

**Chief Investigators:** Dr Maria Rumyantseva, Professor Susan Park, Professor Ali Abbas, Dr Duc Nguyen

Enhancing the commercialisation of nano technologies through a better understanding of and innovative methodologies for the assessment of the interdependencies between a technology, the economy and the society.



### Nanosonic Stories

**Chief Investigators:** Associate Professor Alice Motion, Dr Chiara O'Reilly, Dr Naseem Ahmadpour, Dr Daniel Yeadon

Nanosonic Stories researches effective ways to communicate nanoscience through sound. Using original compositions of music, soundscapes and aural storytelling, this catalyst finds new ways to audibly illustrate scientific concepts and articulate emotions inspired by science at some of the smallest scales.



### Developing Interdisciplinary Expertise

**Chief Investigators:** Professor Lina Markauskaite, Professor Peter Goodyear

Improving the understanding of how our research nodes and networks create multidisciplinary knowledge and how they learn to function effectively. In addition, the team investigates what it takes for individuals to develop the resourcefulness needed to tackle interdisciplinary challenges.



### Engaged Innovation Scholarship for Impact

**Chief Investigators:** Professor Steven Maguire, Dr Jarryd Daymond

Simultaneous teaching and research about innovation, entrepreneurship and related topics by social scientists who are embedded in Sydney Nano's multidisciplinary nodes to study and contribute to innovation 'in the making'.

### NanoResonance

**Chief Investigators:** Dr Diana Chester, Dr Benjamin Carey, Liam Bray, Dr Luke Hespanhol

The multidisciplinary NanoResonance team explores the outputs of scientific data creatively, investigating modes of creative expression made possible by combining 3D audio and video with machine learning and artificial intelligence methods.



“NanoHealth 2.0 will focus on delivering sustainable real-world solutions to the growing health challenges exacerbated by climate change and develop tools to address the impact on climate change caused by the health sector.”

Professor Ben Eggleton  
Director



**Professor Ben Eggleton**  
Director, The University of Sydney Nano Institute



**Professor Mark Rees**  
Deputy Executive Dean (Research Partnerships),  
Faculty of Medicine and Health

## Sydney Nano Networks

Sydney Nano Networks are created and co-led with faculties. Aligned with faculty strategies, the networks form integrated large-scale research focus areas with the potential of achieving transformational research outcomes and global impact. In 2022, we continued to expand our two Networks, NanoHealth and the Smart Sustainable Building Network. The second stage of the NanoHealth network, NanoHealth 2.0, will be launched in 2023 by Sydney Nano and the Faculty of Medicine and Health to provide a clearer focus on specific health challenges affecting our local and global communities, in alignment with the COP26 Health programme's key initiatives.

### NanoHealth Network

Professor Ben Eggleton (Director, Sydney Nano) and Professor Mark Rees (Deputy Executive Dean (Research Partnerships), Faculty of Medicine and Health)

#### Transformational solutions for global health issues

From round-table discussions to the lab, the inaugural Sydney Nano Network, NanoHealth, enables efficient, innovative solutions to health problems. The network opens the dialogue between multidisciplinary researchers, industry, and end users, transforming how nanotechnology is used in areas of medicine and health.

NanoHealth aims to address real-world global health challenges, such as the World Health Organisation's top health priorities; Sustainable Development Goals 3, 9 and 12; and locally, the Australian Medical Research and Innovation priorities. NanoHealth's research priorities are outlined by its clusters.

### Smart Sustainable Building Network

Professor Ben Eggleton (Director, Sydney Nano) and Professor Ben Thornber (Associate Dean Research, Faculty of Engineering)

#### Designing future proof buildings through nanotechnology

The Smart Sustainable Building Network (SSB) connects expertise at the University of Sydney in Engineering and Sciences with academics in Architecture, Design & Planning, Law, Business, and Health to focus on global and national building sustainability priorities. This Network is leveraging cutting-edge multidisciplinary research capabilities with an emphasis on those that are anchored in nanoscale materials and nanotechnology that will lead to innovative capabilities with impact on the built environment.

The SSB Network addresses building-related UN Sustainable Development Goals and contributes to the Australian National Research Priorities as well as the University of Sydney Sustainability Strategies. The SSB Network is structured in two categories, 'Smart Building Blocks' and 'Sustainable Building Management', comprising seven clusters with complementary research priorities.



## NanoHealth Network - Clusters



### Computational Nano-Medicine

Dr Svetlana Postnova and Associate Professor Omid Kavehei

Computational Nano-Medicine is the key to mobilising the next generation of health technology. The cluster aims to advance our understanding of the mechanisms, diagnosis, and treatment of human diseases.



### Sensors and Diagnostics

Dr David Martinez Martin and Professor Corinne Caillaud

This cluster guides clinical decisions for better treatment outcomes by using and creating nanoscale sensors to detect pathogens, cellular responses, molecules of interest, and vital signs.



### Nano-Pharma

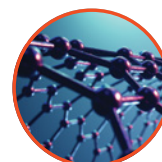
Dr Nicholas Hunt and Dr Pegah Varamini

Nano-Pharma seeks to develop next-generation nanotherapeutics to enable precision clinical treatments. The team engineers nanomaterials, enabling an active and passive targeted delivery of proteins, peptides, bioactive, and drug molecules to cells and organs.

### Nano Bioengineering

Dr Yogambha Ramaswamy and Professor Steven Wise

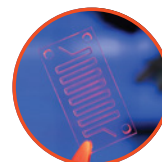
Nano Bioengineering engineers biomaterials at the nanoscale to improve functionality and biological performance. This process including coatings, nanocrystals, nanofiber, and nano catalyst.



### Lab/Organ On-Chip

Dr Daniele Vigolo and Associate Professor Stefano Palomba

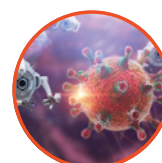
This cluster develops chip-based devices for nanoscale processes including sensing, molecular assembly, chemical synthesis, interfaces, and microfluidics. This allows the team to develop models that mimic human physiology and disease.



### Multifunctional Nanoparticles

Dr Anna Waterhouse and Professor Wojciech Chrzanowski

This team is developing the next generation of multifunctional nanoparticles such as up-conversion nanoparticles and nanorobots, enabling more sensitive disease detection, diagnosis, and therapies.



Our two Networks target the following United Nations' Sustainable Development Goals:



## Smart Sustainable Building Network - Clusters

### Smart Building Blocks

#### Building Envelope

Associate Professor Sandra Loschke and Professor Anna Paradowska

Applying the advantages of nanomaterials and nanostructured surfaces, this cluster creates solutions for building surfaces. Smart facades, roofs, and windows become self-cleaning, control temperature, reduce noise, and harvest and store energy.



#### Indoor Environment

Professor Richard de Dear and Dr Alex Y Song

The Indoor Environment cluster integrates nanotechnologies in temperature, light, and air quality control systems focusing on improvements in user wellbeing and living experiences.



#### Building Efficiency

Dr Arianna Brambilla and Professor Yuan Chen

This cluster tackles efficiency challenges associated with energy, cost, and time consumption for both building construction and operation, developing innovative nanomaterials and applying efficient design principles to create low carbon buildings.



#### Sensors and Automation

Professor Simon Fleming and Dr Ali Hadigheh

This cluster combines cutting-edge artificial intelligence and machine learning algorithms with embedded smart sensors to design automated building systems and optimise functionality and energy consumption of the building operation. The team will shorten sensor design cycles which in turn maximise the design diversity of the next generation of smart sustainable building.



### Sustainable Building Management



#### Circular Construction, Supply Chain & Life Cycle Management

Professor Ali Abbas and Associate Professor Arunima Malik

This cluster aims to enhance energy efficiency in construction while minimising generation of building construction/operation wastes and significantly reducing the number of new materials. This includes analysis of life cycle data of building structures using nano sensor technology. The team will focus on hybrid manufacturing as well as circular and sustainable construction.



#### Virtual Design & Construction

Associate Professor Daniel Dias-da-Costa and Dr Mike Seymour

This cluster will focus on designing a virtual carbon neutral building that is water and energy efficient; has improved air, light, acoustics, and product finishes; promotes physical activity; reduces waste; and considers climate change and environmental impacts in construction and operation.



#### Legislation, Regulations & Rating Schemes

Nicole Marchhart and Dr Katherine Owens

This cluster measures sustainability through the Living Building Challenge imperatives and 6-Star Green Star Rating accreditation. It aims to define market transformation and advocate government legislative requirements.

## Member Engagements and Achievements

Sydney Nano is committed to engaging, developing, and celebrating our members' achievements. Aligned with wider-University strategy and Sydney Nano's strategic fields, our talented members drive key research programs, such as our Grand Challenges and Networks. Our member engagement strategy aims to connect researchers and thought-leaders with our Sydney Nano community for enriching discussions, learning opportunities, and networking.

### Engagements

We held three Sydney Nano Townhalls to inform our community about members' significant achievements, strategy, and direction, and engage with our community members daily via social media, communications, events and forums.



Celebrating Sydney Nano Publication Award success. Photo credit Nicola Bailey.



Sydney Nano Director Prof Ben Eggleton addressing our community at our November 2022 Town Hall. Photo credit Nicola Bailey.

### Distinguished Lectures

Distinguished Lectures connect the Sydney Nano community with world-class researchers on multidisciplinary topics in nanoscience. This year, we hosted:



**Dr Dan Daniel,**  
Agency for Science, Research and Technology (A\*STAR),  
'Slippery when wet: designing ultra-slippery, liquid-repellent surfaces for water-energy nexus and biomedical applications.'



**Distinguished Professor Lidia Morawska,**  
Queensland University of Technology, 'Why is clean air an unmet challenge, and will the pandemic help change this?'



**Professor Zuankai Wang,**  
City University of Hong Kong, 'Nature-inspired surfaces for water-energy nexus'



### Workshops and seminars

In 2022, Sydney Nano offered over 10 seminars on nano-specific topics and researcher trainings attended by nearly 100 members. See the full list in the appendix. We also introduced Nanotechnology Innovation Workshops to facilitate constructive discussions surrounding key issues of health and sustainability across our two Networks; the NanoHealth Network and the Smart Sustainable Building Network.



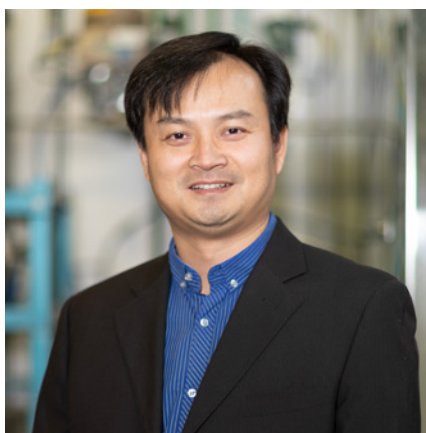
Co-design workshop for the Smart Sustainable Building Network.

### Awards and achievements

Many of our members were awarded with significant grants and prizes in 2022, highlighting the breadth, depth, and quality of our research. Some highlights:



Order of Australia Medal  
Professor Stephanie Watson OAM



ARC Future Fellowships  
Professor Jun Huang and Professor Renae Ryan



Academy of Science Fellowships  
Professor Albert Zomaya and Professor Marcela Bilek



International Association of Advanced Materials (IAAM) Fellowship  
Professor Hala Zreiqat AM



**ARC Centres of Excellence**

- ARC Centre of Excellence for Carbon Science and Innovation: Professor Thomas Maschmeyer
- ARC Centre of Excellence for Green Electrochemical Transformation of Carbon Dioxide: Professor Yuan Chen and Dr Fengwang Li
- ARC Centre of Excellence in Optical Microcombs for Breakthrough Science: Professor Ben Eggleton and Professor Martijn de Sterke



**Eureka Prize Winner for Interdisciplinary Research**  
Associate Professor Arunima Malik



**AFR Emerging Leader Award**  
Professor Elizabeth New



**ARC LIEF Grants**

- Professor Chris Ling
- Professor Michael Kassiou
- Professor Anita Ho-Baillie

**Vice Chancellor's Award for Excellence**

- Associate Professor Maryanne Large
- Associate Professor Omid Kavehei
- Associate Professor Penelope Crossley
- Professor Antonio Tricoli
- Professor Elizabeth New
- Professor Martin Tomitsch
- Professor Susan Park





**7** Members received Vice Chancellor's Awards for Excellence

**7** Members received SOAR Prizes



Sydney Nano awarded:

**7** HDR Development Awards

**2** Joint Research Awards with International Partners

**2** TRL Booster Awards

**6** ECR Support Fund Awards

**5** Publication Awards

Members have received several prestigious awards:



**1** Order of Australia Medal

**1** Eureka Prize Winner

**2** ARC Future Fellowships

**2** Academy of Science Fellowships

**3** ARC Centres of Excellence

**3** ARC LIEF Grants

**16** ARC Discovery Project Grants

**1** Fulbright Postgraduate Scholarship



**10**

Sydney Nano Members have been promoted



Sydney Nano held:

**12** Future Leader Training Program Sessions

**4** Nanotechnology Innovation Workshops

**3** Distinguished Lectures

## Academic Partnerships

### Strategic partners of Sydney Nano

In 2022, Sydney Nano has established new partners, strategically advanced existing partnerships, and continued to grow a major global network. By connecting with local and international partners, we are creating global impact in areas pertaining to sustainability, health, and wellbeing.

### Our new academic partnerships

#### MacDiarmid Institute

In 2022, Sydney Nano partnered with the MacDiarmid Institute for Advanced Materials and Nanotechnology. We organised two workshops, one to identify overlapping research themes and the second on Future Computing, held at the Sydney Nanoscience Hub. We also offered a Joint Research Award, engaging researchers from both partner institutions to coalesce their research to produce sustainable, long-term collaborations and new opportunities with visibility in high profile areas.

#### Indian Institute of Technology, Madras (IITM)

Sydney Nano hosted a workshop on Solar Energy Harvesting with the Indian Institute of Technology, Madras in 2022. We participated in three additional workshops organised by IITM. As a direct result of our partnership with IITM, a University-wide partnership with IITM was created and led by the Office of Global and Research Engagement on carbon neutrality. Four grants have been awarded for joint projects with IITM and the University of Sydney is now part of the Energy Consortium.

#### Heidelberg University Delegation

In 2022, Sydney Nano welcomed a delegation from the University of Heidelberg, a new strategic partner of the University of Sydney. Our International Ambassador for Europe, A/Prof Markus Muellner, collaborates closely with this institution.

### We continue to foster and grow established partnerships

#### Microfluidics Consortium

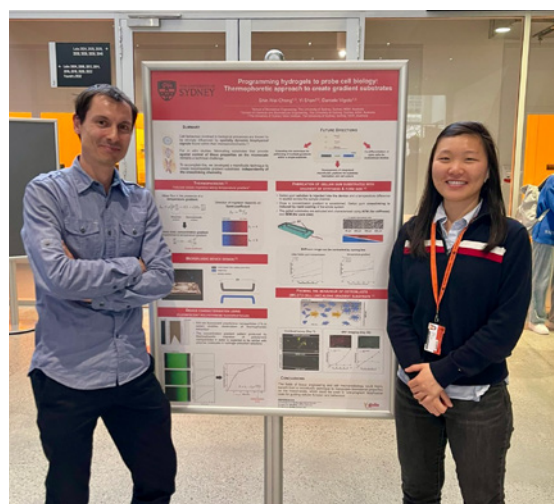
In 2022, Sydney Nano continued our membership in the Microfluidics Consortium, a global nanotechnology organisation. We facilitated the Sydney Nano Micro/nanofluidics satellite event as a prelude to the Microfluidics Global EXPO hybrid event, in which Sydney Nano participated as an Australian node. Sydney Nano also participated virtually in the Microfluidics Consortium meeting in Enschede, the Netherlands.

#### Network 4 Sustainable Nanotechnology (N4SN)

Sydney Nano is a founding member of the International Network for Sustainable Nanotechnology, a consortium of leading organisations in the field of nanotechnology, representing institutes, universities, non-profit and governmental agencies. In collaboration with the Waterloo Institute of Nanotechnology and aligned with the United Nation's SDGs, the main function of the Network is the promotion of nanotechnology advancement for sustainability and to ensure the sustainability of nanotechnology. In 2022, Sydney Nano organised a satellite event to the N4SN Global Summit "Nanotechnology for a healthier and sustainable future" that took place in Waterloo. We plan to host the Global Summit for 2023 in Sydney, with many distinguished international researchers attending the event in-person.

#### Bar-Ilan Institute of Nanotechnology and Advanced Materials (BINA)

Our partnership with Bar-Ilan University, Institute of Nanotechnology and Advanced Materials (BINA) explores fundamental aspects of material design, magnetism and photonic phenomena, developing clean technologies and more. In 2022, we awarded a Joint Research Award to facilitate collaboration of Sydney Nano Members with members of BINA.



Images (from left to right): Key researchers from the MacDiarmid Institute visiting the Sydney Nanoscience Hub to attend the Future Computing Symposium; Poster session at the Sydney Nano Micro/nanofluidics satellite event.

### Nanotechnology Industries Association (NIA)

The NIA supports innovation and commercialisation of next generation nanotechnologies and promotes their safe and reliable advancement. Sydney Nano continues to contribute to this association.

### Waterloo Institute for Nanotechnology (WIN)

In partnership with the Waterloo Institute for Nanotechnology (WIN) at the University of Waterloo, Canada, we are committed to real-world innovation and our activities centre around the development of smart and functional materials, sensors and theranostics that address global challenges faced by our society. In 2022 we continued to engage with WIN.

### Zhejiang University, China

With the Faculty of Engineering, Sydney Nano has partnered with Zhejiang University to explore collaborative research, training, and teaching activities to develop the 'Australia-China Joint Research Centre for Sustainable Environment.' This led to the establishment of a joint Sustainability Lab led by former Grand Challenge Champion Professor Jun Huang. As part of this lab, Professor Huang facilitated an online Asia-Pacific Carbon Neutrality symposium organised by OGE and an online seminar for Zhejiang University students. Professor Huang also secured an SDG International Strategy Grant together with Zhejiang University. Additionally, they organised the Special Issue for the Joint Lab in the high-ranking journal Materials Today Sustainability.

### Instituto Italiano di Tecnologia, Italy (ITT)

Our partnership addresses unmet clinical and societal needs and will be a fundamental building block in establishing the next generation research in nano-bioinfo-cogno networks. In 2022, we secured a H2020 (\$5M) grant led by Professor Wojciech Chrzanowski. Professor Chrzanowski visited three key IIT centres where he gave talks and continued to engage with IIT members.

### Institute of Technology, Bombay

We're establishing a research program focusing on sensing technologies for the detection of pollution in air and water.

### Institute of Nano Science and Technology (INST), Punjab

In 2022, Sydney Nano continued to engage with the Institute of Nano Science and Technology (INST) in Punjab. We are identifying collaboration opportunities for future partnerships in India.

### Pusan National University

Our partnership with the College of Nanoscience and Nanotechnology, Pusan National University continues to develop the Bio-Medical Global Educational Program.

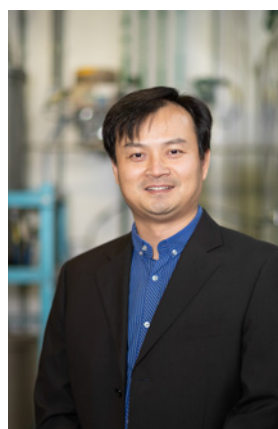
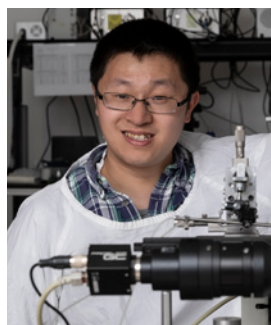
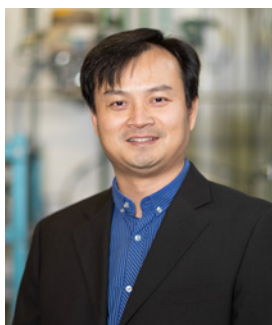


Images (from left to right): Sydney Nano welcoming a delegation from the University of Heidelberg; Professor Wojciech Chrzanowski addressing attendees at the Sydney Nano Satellite Event to the N4SN Global Summit.

### OGE Partnership Collaboration Awards

Congratulations to the nine Sydney Nano Members who received the Office of Global Engagement Partnership Collaboration Awards. These awards provide researchers with an opportunity to engage with strategic research partners to develop new international projects. Congratulations to:

- Dr Anastasia Globa, with The University of Edinburgh
- Professor Anita Ho-Baillie, with University College London
- Professor Brendan Kennedy, with The University of Edinburgh
- Professor Jun Huang, with Yonsei University
- Associate Professor Arnold Lining Ju, with University of Glasgow
- Associate Professor Markus Muellner, with Yonsei University
- Associate Professor Omid Kavehei, with The University of Glasgow
- Professor Siegbert Schmid, with FACES
- Dr Xianghai An, with Zhejiang University



### Sydney Nano Joint Research Awards

Sydney Nano partnered with two institutions to offer Joint Research Awards, aimed at engaging researchers from both Sydney Nano and the partner institutions to identify areas of research overlap coalesce their research to produce sustainable, long-term collaborations and new opportunities with visibility in high profile areas.

- Professor Jun Huang, Bar-Ilan Institute of Nanotechnology and Advanced Materials (BINA)
- Dr John Bartholomew, the MacDiarmid Institute for Advanced Materials and Nanotechnology

### Internal academic partnerships:

Sydney Nano also supports jointly funded collaboration with strategic partners of the University of Sydney, including:

- **Save Sight Institute**  
Our Deputy Co-Director for Industry, Innovation, and Commercialisation, Professor Stephanie Watson, works closely with the Save Sight Institute. In 2022, we co-hosted a Nanotechnology Innovation Workshop focussed on 'Nanoscale solutions for sight in a changing global environment.'
- **The Engineering Faculty**  
Sydney Nano launched the 'Australia-China Joint Research Centre for Sustainable Environment' with Zhejiang University.

“The MacDiarmid Institute is thrilled to partner with Sydney Nano. As well as being geographical neighbours, our two centres share a common view that research must play a leading role in addressing the grand challenges we face around sustainability and climate change.”

**Professor Justin Hodgkiss**  
Co-Director, The MacDiarmid Institute for Advanced  
Materials and Nanotechnology



## Industry, Innovation and Commercialisation

Sydney Nano prioritises creating knowledge for innovation and impact. Our collaboration with researchers across the University and with industry partners facilitates our entrepreneurial culture. We enable researchers to innovate and pursue commercial interests, providing mutual opportunity for both Sydney Nano and our collaborators.

### Key partnerships and projects

Multiple research groups are collaborating closely with the Australian Defence Force, applying nanophotonics and sensing technologies:

- Professor James Rabeau and Associate Professor Omid Kavehei are supported by the **Defence Innovation Network** and the US Air Force Research Labs to develop new Quantum Sensing technology
- The **Photonics Research Group**, led by Professor Xiaoke Yi, has significant collaboration with the Defence Science and Technology Group (DSTG), the Department of Defence and Industry, with its achievements benefiting industry and society in the areas of information processing, defence, security, and health.

- Professor Ben Eggleton leads the **Jericho Smart Sensing Lab** located in the Sydney Nanoscience Hub (SNH) with cutting-edge researchers and designers working together to deliver unprecedented sensing technology for the Royal Australian Airforce (RAAF). This funding has been extended for 2022.

In the energy sector, we are collaborating with industry partners:

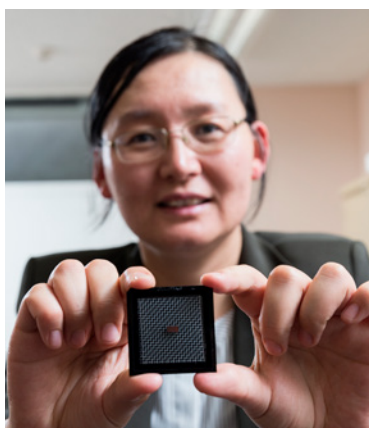
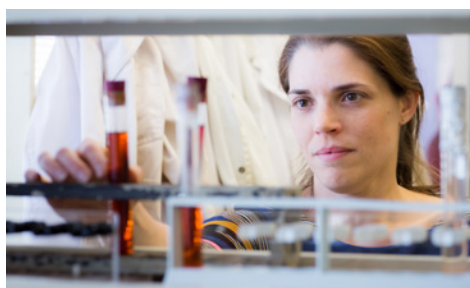
- Professor Anita Ho-Baillie works with industry partners for the use of light-weight, cheap and ultra-thin, perovskite crystals in photovoltaic devices for harvesting solar power. In 2023, Professor Ho-Baillie will join forces with Sydney-based renewable technology company SunDrive to commercialise perovskite-silicon cells.
- Professor Thomas Maschmeyer's start-up, Gelion Technologies, continues the commercialisation of cheap, safe and durable zinc-bromine batteries that outcompete lithium-ion technology.





### Other industry partnerships

- Dewpoint is a start-up company out of the University of Sydney that is committed to reducing our impact on the environment by developing unique water capture technologies. This company is founded on research developed throughout Professor Chiara Neto and Professor Martijn de Sterke's Sydney Nano Grand Challenge research project on ACWA - Advanced Capture of Water from the Atmosphere.
- Professor Deanna D'Alessandro, Sydney Nano Grand Challenge Champion, is the Director of the Net Zero Initiative. Professor D'Alessandro works closely with industry partners to develop decarbonisation technologies.
- Our researchers are developing quantum computing and sensing solutions for major challenges in various segments such as defence, aerospace, health, logistics, transportation, and commodities
- Led by Professor David Reilly, the University of Sydney and Microsoft's multi-year partnership in Quantum Computing research, conducted in the Sydney Nanoscience Hub (SNH), continues to produce significant results
- Q-Ctrl, founded by Professor Michael Biercuk operates from SNH and continues to support global venture capital firms, remaining a trusted provider of quantum control for emerging technologies
- The Semiconductor Sector Service Bureau (S3B) was founded in 2022 as a direct result of the NSW semiconductor industry roadmap prepared by Professor James Rabeau and commissioned by the Office of the NSW Chief Scientist and Engineer. The inaugural Director of the S3B is Dr Nadia Court.



### Developing expertise in translational research highlights

- The Sydney Nano Catalyst Scheme 'Nano Technology - Economy - Society', with Chief Investigators Dr Maria Rumyantseva, Professor Susan Park, Professor Ali Abbas, and Dr Duc Nguyen. This research explores how to enhance the commercialisation of nanotechnologies through a better understanding of and innovative methodologies for the assessment of the interdependencies between a technology, the economy, and the society.

### Nanotechnology Innovation Workshops

In 2022, Sydney Nano established Nanotechnology Innovation Workshops, enabling collaborations between researchers in academia and industry. Through these workshops, we connected with:

- Dr Mobin Nomvar, Scimita Ventures
- Hudson Worsley, MECLA Alliance
- Jeff Oatman, Green Building Council of Australia (GBCA)
- Jude Stern, International Agency for the Prevention of Blindness (IAPB)
- Mitasha Yu, IAPB Climate Action work group & World Health Organisation, Vision & Eye Care
- Natasha Rawlings, Uniseed
- Professor Peter McCluskey, Save Sight Institute
- Sally-Ann Williams, Cicada Innovations

### Technical Readiness Level (TRL) Booster Scheme

The University of Sydney Nano Institute TRL Booster Scheme, launched in 2022, aims to foster the translation of a nanotechnology invention into market-ready solutions by providing both funding and coaching by one of Sydney Nano's Deputy Directors for Industry, Innovation & Commercialisation. Congratulations to our 2022 Winners:

- Professor Marcela Bilek
- Dr Gurvinder Singh

## External Engagement

Sydney Nano prioritises creating knowledge for innovation and impact. Our collaboration with researchers across the University and with industry partners facilitates our entrepreneurial culture. We enable researchers to innovate and pursue commercial interests, providing mutual opportunity for both Sydney Nano and our collaborators.

### Sydney Nano Ambassador Program

In 2022, our six Student Ambassadors nominated in 2021 continued their roles. Mentored by the Deputy Director for External Engagement and Academic Development, Associate Professor Alice Motion, these ambassadors are given the opportunity to develop their skills in research communication project management, and leadership.

### Splendour in the Grass

Our Student Ambassadors volunteered at the Science Tent during the music festival Splendour in the Grass. Here, they ran experiments and demonstrations for the 50,000 festivalgoers who drop into the Science Tent in between sets. Deputy Director Associate Professor Alice Motion also gave a talk on sonaphors (a portmanteau of 'sonic' and 'metaphor'), a new sound-based learning tool.



Meeting with Student Ambassadors Laura Haidar, Tim Newman, Jed Austin, Queenie Yip, and ASU Leesa L'Episcopo.

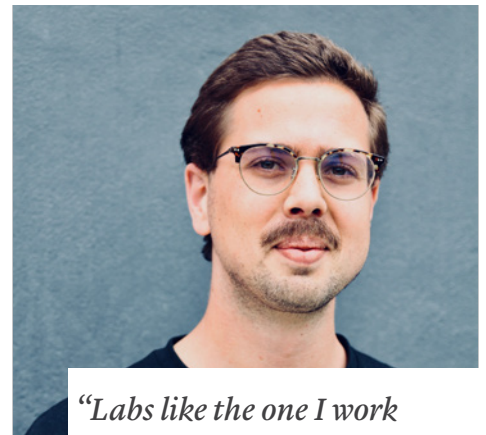


Sydney Nano Student Ambassadors Jed Austin, Tim Newman, and Queenie Yip volunteering at the Science Tent during Splendour in the Grass.

*“As a Sydney Nano Student Ambassador, I joined a tight network of ambitious leaders and innovative thinkers. This made me think differently and creatively about scientific research and its potential to impacting our lives for the better.”*

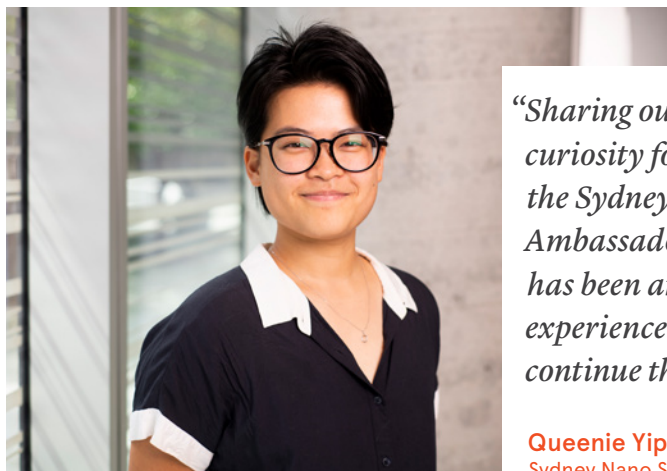


**Bryce Mullens**  
Sydney Nano Student Ambassador



*“Labs like the one I work in are so often seen as ivory towers, but we have a responsibility to communicate our research to the public. It's been a privilege to learn more about that process, and to try to shine a light on what goes on behind the laser curtains.”*

**Timothy Newman**  
Sydney Nano Student Ambassador



*“Sharing our love and curiosity for science through the Sydney Nano Student Ambassador program has been an invaluable experience that I hope to continue throughout life.”*

**Queenie Yip**  
Sydney Nano Student Ambassador

## Public Events - Highlights

Sydney Nano engaged with our community consistently throughout the year. Some highlights are shown below:

### Lines of Best Fit – Science Improv Comedy

Lines of Best Fit was created as part of Olivia McRae's PhD project, which explores novel and creative ways of communicating science to the public. During National Science Week, Olivia partnered with Sydney Nano researchers and improvisors from Improv Theatre Sydney to deliver two nights of action-packed fun. Associate Professor Girish Lakhwani, Professor Anita Ho-Baillie and Dr Fengwang Li, Professor Corinne Caillaud and Zahra Lotfibakalani, and Professor Stephanie Watson shared their research to over 100 people who attended the event. Olivia won the University of Sydney Student Innovation Award for Social Impact for this project.



Lines of Best Fit – Science Improv Comedy during National Science Week. Created by Olivia McRae.

### Live from the Lab | FBI Radio Podcast

Live from the Lab (LFTL) is a celebration of Australian music, science, arts, and culture. Created by Associate Professor Alice Motion, Deputy Director External Engagement and Academic Development, LFTL partners musicians with science researchers to create unique compositions. In 2022, Sydney Nano researchers Professor Zdenka Kuncic and Professor Francois Aguey-Zinsou partnered with artists Kid Fiction and Gloomie respectively to create science-inspired music. These tracks were discussed at the In Conversation night and then performed live at the inaugural Live from the Lab gig. The music was also played on FBI radio during National Science Week. Sydney Nano Director Professor Ben Eggleton opened the In Conversation event.



Live from the Lab: In Conversation was held in August 2022. This event featured both musicians and scientists discussing the personal stories behind the science, breaking down the wonders, complexity, connections, and emotions captured in the new musical compositions. Hosted by Associate Professor Alice Motion. Photography by Jayne Ion.

### Artist in Residence Program

Sydney Nano *Artists in Residence* continued their residencies in 2022. The program facilitates collaborations between artists and researchers in nano and quantum science and provides a space for exploring relationships between artistic practice and research in nanoscience and technology.

- Dr Daniel Blinkhorn (Sydney Conservatorium of Music), supporting Nanosonic Stories Catalyst node
- Dr Luke Hespanhol (School of Architecture, Design and Planning), supporting NanoResonance Catalyst node



Dr Luke Hespanhol is a transdisciplinary media artist and senior lecturer/researcher in Interaction Design, with particular focus on urban media. He is part of the NanoResonance Catalyst multidisciplinary team.



Dr Daniel Blinkhorn is a Lecturer at the Sydney Conservatorium of Music, as well as a composer, digital media artist & field recordist, often working with environmental sounds. He is part of the Nanosonic Stories Catalyst multidisciplinary team.

## Academic Development

Sydney Nano is focused on training the next generation of academic leaders through offering leadership opportunities, mentoring, and seminars in fields such as grant writing and research commercialisation. Sydney Nano also offers a number of Distinguished Lectures and seminars from researchers across a range of fields related to nanotechnology.

### Taste of Research awards

In 2022, eight high-performing undergraduate students were offered the opportunity to develop their research skills through our “Taste of Research” program. Throughout a six-week research program, the students gained experience into working with Sydney Nano Members in an academic lab environment, finding solutions to real-world challenges related to nanoscience and technology. Congratulations to:

- Esther Zhang, hosted by Dr Ann Kwan (School of Life and Environmental Sciences)
- Gweneth Masonsong, hosted by Dr Daniele Vigolo (School of Biomedical Engineering)
- Hongbin Luo, hosted by Dr Xianghai An (School of Aerospace, Mechanical and Mechatronic Engineering)
- Isabella O’Connor, hosted by Dr Shelley Wickham (School of Chemistry)
- Joel Sved, hosted by Professor Xiaoke Yi (School of Electrical and Information Engineering)
- Justin Brown, hosted by Dr John Bartholomew (School of Physics)
- Miguel Campos, hosted by Dr Belal Chami and Dr Yogambha Ramaswamy (School of Biomedical Engineering and School of Medical Science)
- Sofia Balingit, hosted by Associate Professor Markus Muellner (School of Chemistry)

### EMCR Development Nodes

The EMCR Development Nodes were created to provide EMCRs with the opportunity to build and lead a multidisciplinary research team in order to gain practical experience in leadership and academic skills with mentorship and training from senior colleagues. We currently have 18 EMCRs participating in this program.

In 2022, a new Kickstarter ‘NanoFab’ was launched as a direct result of the networking and mentorship from the EMCR Development Nodes.



*“The Taste of Research award has fast-tracked my professional development and improved my research skills, technical knowledge, and personal confidence as I progress in my studies.”*

#### Miguel Campos

Taste of Research 2022 awardee, School of Biomedical Engineering and School of Medical Sciences

### Future Leaders Training Program

In 2022, the Sydney Nano Future Leaders Training Program was launched. This program aims to develop management soft skills for PhD students and PostDocs to enhance their future careers in academia and industry. A total of 12 sessions were held in 2022, covering topics such as intellectual property and commercialisation, strategy development, and multidisciplinary. The full list can be found in the appendix. We plan to organise a training bootcamp in combination with the EMCR development nodes in early 2023 to enable further networking opportunities.



Kickstarter ‘NanoFab’ Chief Investigators Dr Ali Hadigheh and Dr Anastasia Globa with Sydney Nano Director Professor Ben Eggleton.

## Studying Nano

Sydney Nano supports our Members in their nanotechnology relevant units across several faculties and schools, including:

- NANO2002: Introduction to Nanoscience (Faculty of Science)
- NANO4001: Modern Nanoscience (Faculty of Science)
- CHNG5008: Nanotechnology in Chemical Engineering (Faculty of Engineering)
- CHEM3888 and PHYS3888: Interdisciplinary Project (Faculty of Science)
- SIEN6004: Innovation Ecosystems (University of Sydney Business School) – focused exclusively on work with Sydney Nano scientists to create commercialisation roadmaps for their technologies
- SIEN1000/BUSS4917: Innovation and Entrepreneurship Project (University of Sydney Business School) – with guest lectures from Sydney Nano Members

## Learning Ecology at Sydney Nano

At Sydney Nano, our research is underpinned by collaboration and multidisciplinary partnerships. One of our Catalyst schemes, ‘Developing Interdisciplinary Expertise’ with Chief Investigators Professor Lina Markauskaite and Professor Emeritus Peter Goodyear, examines how Sydney Nano research nodes create multidisciplinary knowledge and how they learn to function effectively. In studying the learning ecology at Sydney Nano, ‘Developing Interdisciplinary Expertise’ Catalyst researchers write:

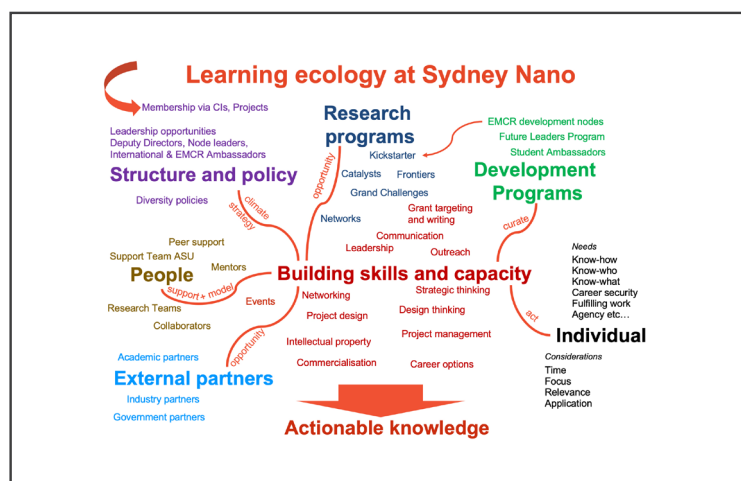
“In Sydney Nano and other research institutes, an immersive apprenticeship is a common avenue for developing research expertise. Sydney Nano supplements and enhances this experiential learning in two main ways:

1. by embedding activities and policies into practice that include mentoring, peer support and leadership opportunities; and
2. targeted programs for developing personal resourcefulness towards leading interdisciplinary projects.

For example, the Future Leaders and Early and Mid Career (EMCR) development node programs curate identified training needs, touching on leadership, business, communication and design skills. These programs also, importantly, support peer networking. The tiered and phased nature of research funding, with an emphasis on interdisciplinary and diverse leadership, supports research and researchers from kernels of ideas through to multi-year, complex, applied projects. Sydney Nano routinely invites critical feedback on this ecosystem in which individuals, project teams and the institute’s interdisciplinary capacity and agency are developed simultaneously.”

## Prof Lina Markauskaite and Dr Natalie Spence

Faculty of Arts and Social Sciences, researchers in Sydney Nano Catalyst scheme ‘Developing Interdisciplinary Expertise’.



A sketch of the learning ecology at Sydney Nano, developed by researchers within the Catalyst ‘Developing Interdisciplinary Expertise’. Image reproduced with permission by Dr Natalie Spence.

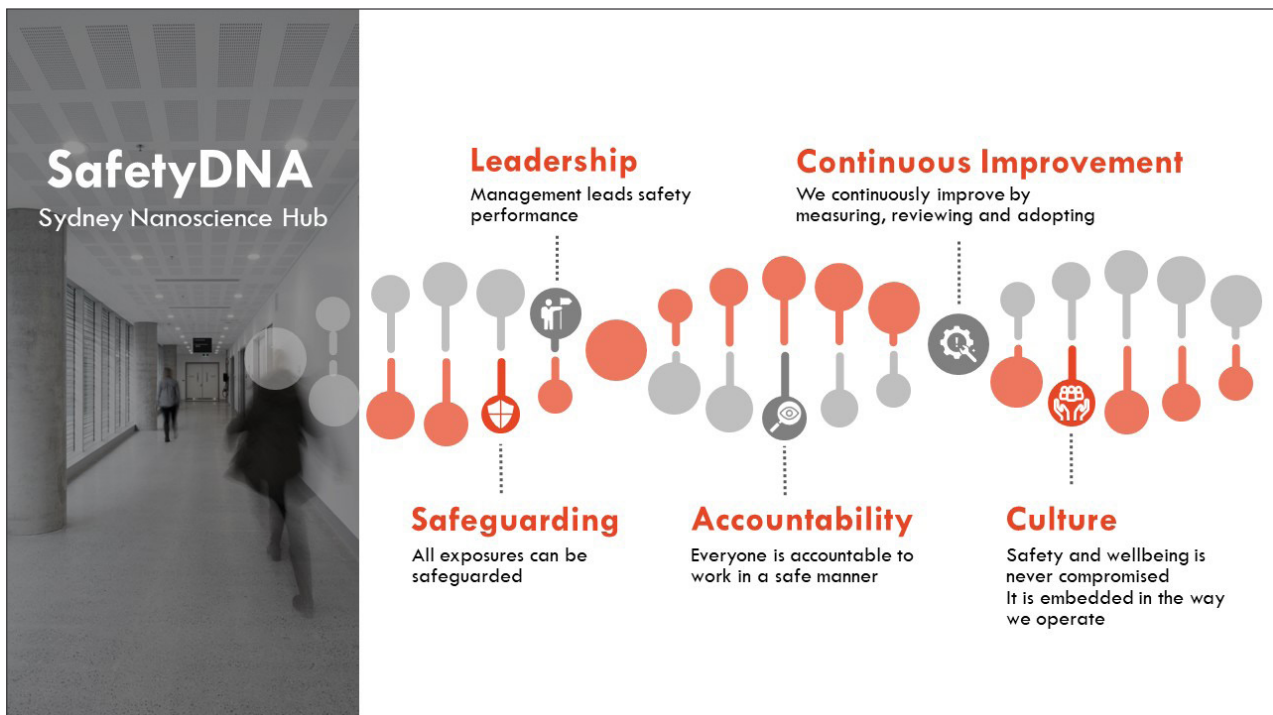


## Infrastructure and Enabling Capabilities

One of our strategic objectives is to enable access to world-class research infrastructure while maximising the return on the University's investment in state-of-the-art research infrastructure. We are achieving this through facilitating the optimal use of the Sydney Nanoscience Hub; supporting the development and use of the University's Core Research Facilities; facilitating access to the equipment platform by our members; influencing the development of the Western Sydney campus; and gaining access to national and international research infrastructure.

The Sydney Nanoscience Hub (SNH) has been designed to provide research in the field of Nano Photonics and Quantum Science. SNH is home to 14 distinct user groups with a combined total of 161 occupants in 2022.

The user groups at the Sydney Nanoscience Hub have developed a "SNH Safety DNA", reflecting our philosophy and values in conducting work safely. These include leadership, safeguarding, accountability, continuous improvement, and culture.



## Sydney Nanoscience Hub hosts



8

Research groups



3

CRF Facilities



2

Industry partners  
(Microsoft, Q-CTRL)



1

Multidisciplinary Institute  
(Sydney Nano)



161

occupants

## Sydney Nanoscience Hub comprises



10,000m<sup>2</sup>

state-of-the-art teaching  
and learning facilities



32

state-of-the-art  
nanoscience research  
laboratories



900m<sup>2</sup>

ISO Class 5  
cleanroom

# Outlook 2023

I was delighted to step into the position of Interim Director of Sydney Nano when Professor Ben Eggleton accepted his new role as PVC Research.



Under Ben's Directorship, Sydney Nano has achieved many significant milestones and established a culture of innovation, collaboration, and excellence. Building upon Ben's leadership, I'm excited to work together with our community as Interim Director.

Looking ahead to 2023, we have much to anticipate and celebrate:

The second cohort of our flagship Grand Challenge research nodes will enter their final year of funding. Each of these four multidisciplinary projects are making great strides towards technologies that will improve human health and reduce our impact on the environment. Sydney Nano endorsed three new Kickstarters over the last year, each fostering innovative research ideas with multidisciplinary teams. We also recently launched a transformative TRL Booster scheme, which aims to accelerate the translation of our research outcomes into practical solutions that benefit society. I look forward to seeing how all of our research nodes progress, and the impact of each of these talented teams into the future.

I am thrilled to welcome Dr Maria Rumyantseva to our executive team as the new co-Deputy Director for Industry, Innovation, and Commercialisation alongside Professor Stephanie Watson. Maria brings a wealth of experience and a fresh perspective that will support our efforts to deepen and expand our connections with industry. I would like to thank our outgoing co-Deputy Director Professor Ali Abbas for his leadership and many valuable contributions to Sydney Nano.

In 2023, we will continue to place a strong emphasis on academic development. We are expanding our Future Leaders Program and EMCR Development Node by establishing a bootcamp program that will provide our members with a comprehensive skillset to support them in the next stages of their career whether in academia or professional contexts.

And finally, towards the end of the year Sydney Nano will welcome international partners and leaders in nanoscience and nanotechnology from around the world as hosts of the International Network for Sustainable Nanotechnology Global Summit. The three-day summit, aligned with Sustainable Development Goal 7 on Affordable and Clean Energy, will facilitate discussions and build new partnerships to advance 'Nanotechnology for Sustainable Energy Security'.

During my tenure as Interim Director I will work hard to foster diverse, innovative, and impactful collaborations. I firmly believe that by bringing together different perspectives and areas of expertise, we can unlock new possibilities and generate ground-breaking solutions to the complex challenges facing society.

In conclusion, as we step into 2023, I am filled with optimism and enthusiasm for the opportunities and challenges that lie ahead. Together, let us build upon our achievements, undertake transformational research, and shape a future that inspires the next generation of leaders.

**Associate Professor Alice Motion**  
Interim Director, The University of Sydney



“Sydney Nano has positioned itself as a global leader in multidisciplinary research, tackling the world's greatest challenges surrounding health and sustainability by collaborating and engaging with diverse academic partners, industry leaders, and external stakeholders.”

**Professor Kathy Belov AO FAA FRSN**  
Pro-Vice-Chancellor, Global and Research Engagement,  
The University of Sydney



# Key Engagements

In 2022, Sydney Nano organised a series of fantastic events and welcomed numerous esteemed guests to the Sydney Nanoscience Hub, such as government officials, international delegations, donors, and investors. Some key engagements are listed below, see the appendix for the full list.

- US Ambassador Caroline Kennedy and Consul General Christine Elder
- Defence Acquisition Program Administration (DAPA) and The Republic of South Korean Agency for Defence Development (ADD) Delegates
- German-Australia Chamber of Industry and Commerce (GACIC) Health Cluster Delegation
- Professor Hugh Durrant-Whyte, NSW Chief Defence Scientist and Engineer
- Senate Building and Estates Committee Members
- Tech Central Alliance Partners, including: Clover Moore, Lord Mayor; Teresa Anderson, CEO of the Sydney Local Health District; Hon. John Ajaka, Chair Sydney Local Health District Board
- The French National Centre for Scientific Research (CNRS): Dr Jean-Paul Toutain, Director of the CNRS representative office for Oceania; Camille Bitton, Scientific and Communication project manager
- The Hon. Alister Henskens, SC MP, Minister for Skills and Training, and Minister for Science, Innovation and Technology
- The Hon. Ed Husic MP, Shadow Minister for Industry and Innovation
- The Hon. Paul Fletcher MP, Shadow Minister for Digital Economy, Science and the Arts
- United States House & Senate Armed Services Committee



Photos from top left (clockwise): Ambassador Caroline Kennedy and Consul General Christine Elder; United States House & Senate Armed Services Committee; Defence Acquisition Program Administration (DAPA) and The Republic of South Korean Agency for Defence Development (ADD) Delegates; German-Australia Chamber of Industry and Commerce (GACIC) Health Cluster Delegation.

# Appendix

## List of Members

- Abbas El-Zein, Faculty of Engineering
- Ahmad Jabbarzadeh, Faculty of Engineering
- Ainsley Newson, Faculty of Medicine and Health
- Albert Zomaya, Faculty of Engineering
- Alejandro Montoya, Faculty of Engineering
- Alessandro Tuniz, Faculty of Science
- Alex Song, Faculty of Engineering
- Ali Abbas, Faculty of Engineering
- Ali Hadigheh, Faculty of Engineering
- Alice Motion, Faculty of Science
- Alistair McEwan, Faculty of Engineering
- Allison Tong, Faculty of Medicine and Health
- Anastasia Globa, The University of Sydney School of Architecture, Design and Planning
- Andrew Doherty, Faculty of Science
- Anita Ho-Baillie, Faculty of Science
- Ann Kwan, Faculty of Science
- Anna Paradowska, Faculty of Engineering
- Anna Waterhouse, Faculty of Medicine and Health
- Anne Mai-Prochnow, Faculty of Engineering
- Annette Haworth, Faculty of Science
- Antonio Tricoli, Faculty of Engineering
- Anusha Withana, Faculty of Engineering
- Arianna Brambilla, The University of Sydney School of Architecture, Design and Planning
- Arunima Malik, Faculty of Science
- Asaph Widmer-Cooper, Faculty of Science
- Axel Spahr, Faculty of Medicine and Health
- Aysu Kuru, The University of Sydney School of Architecture, Design and Planning
- Belal Chami, Faculty of Medicine and Health
- Benjamin Goldys, Faculty of Science
- Benjamin Carey, Sydney Conservatorium of Music
- Benjamin Eggleton, Faculty of Science
- Boris Kuhlmeier, Faculty of Science
- Brendan Kennedy, Faculty of Science
- Brian Hawke, Faculty of Science
- Brian Jones, Faculty of Science
- Cameron Kepert, Faculty of Science
- Cary Di Lernia, The University of Sydney Business School
- Catherine Hardy, The University of Sydney Business School
- Catherine Stampfl, Faculty of Science
- Chengwang Lei, Faculty of Engineering
- Chiara Neto, Faculty of Science
- Chiara O'Reilly, Faculty of Arts and Social Sciences
- Christopher Ling, Faculty of Science
- Corinne Caillaud, Faculty of Medicine and Health
- Craig Jin, Faculty of Engineering
- Damien Ricketson, Sydney Conservatorium of Music
- Daniel Blinkhorn, Sydney Conservatorium of Music
- Daniel (Danny) Gozman, The University of Sydney Business School
- Daniel Dias-da-Costa, Faculty of Engineering
- Daniel Tan, Faculty of Science
- Daniel Yeadon, Sydney Conservatorium of Music
- Daniele Vigolo, Faculty of Engineering
- David Hibbs, Faculty of Medicine and Health
- David Martinez Martin, Faculty of Engineering
- David McKenzie, Faculty of Science
- David Wang, Faculty of Engineering
- Deanna D'Alessandro, Faculty of Science
- Diana Chester, Faculty of Arts and Social Sciences
- Dominic Williamson, Faculty of Science
- Dries Verstraete, Faculty of Engineering
- Elizabeth New, Faculty of Science
- Eugenia Gasparri, The University of Sydney School of Architecture, Design and Planning
- Fariba Dehghani, Faculty of Engineering
- Fengwang Li, Faculty of Engineering
- Filip Braet, Faculty of Medicine and Health
- Francois Aguey-Zinsou, Faculty of Science
- Freda Passam, Faculty of Medicine and Health
- Georges Grau, Faculty of Medicine and Health
- Girish Lakhwani, Faculty of Science
- Gregg Suaning, Faculty of Engineering
- Gregory Warr, Faculty of Science
- Gurvinder Singh, Faculty of Engineering
- Gwenaelle Proust, Faculty of Engineering
- Hak-Kim Chan, Faculty of Medicine and Health
- Hala Zreiqat, Faculty of Engineering
- Helen Bramley, Faculty of Science
- Hien Duong, Faculty of Medicine and Health
- Ingemar Persson, Faculty of Engineering
- Ivan Kassal, Faculty of Science
- Iver Cairns, Faculty of Science
- James Der Derian, Faculty of Arts and Social Sciences
- Jarryd Daymond, The University of Sydney Business School
- Jianguo (Joe) Zhu, Faculty of Engineering
- Joel Mackay, Faculty of Science
- John Bartholomew, Faculty of Science
- John Grigg, Faculty of Medicine and Health
- Joyce Hinterding, Faculty of Arts and Social Sciences
- Julie Cairney, Faculty of Engineering
- Jun Huang, Faculty of Engineering
- Justin Beardsley, Faculty of Medicine and Health
- Jyotirmoyee Bhattacharjya, The University of Sydney Business School
- Kanchana Thilakarathna, Faculty of Engineering
- Katherine (Kate) Owens, The University of Sydney Law School
- Katrina Jolliffe, Faculty of Science
- Ken-Tye Yong, Faculty of Engineering
- Kimberly Mathieu Coulton, Faculty of Medicine and Health
- Lauren Macreaide, Faculty of Science
- Laurence Macia, Faculty of Medicine and Health
- Li Chang, Faculty of Engineering
- Li Wei, Faculty of Engineering
- Lin Ye, Faculty of Engineering
- Lina Markauskaite, Faculty of Arts and Social Sciences
- Ling Zhu, Faculty of Medicine and Health
- Lining Ju, Faculty of Engineering
- Liwei Li, Faculty of Engineering
- Louis Rendina, Faculty of Science
- Luke Hespanhol, The University of Sydney School of Architecture, Design and Planning
- Luming Shen, Faculty of Engineering
- Marcela Bilek, Faculty of Engineering
- Margaret Sunde, Faculty of Medicine and Health
- Margot Day, Faculty of Medicine and Health
- Maria Rummyantseva, The University of Sydney Business School

- Mark Gillies, Faculty of Medicine and Health
- Markus Muellner, Faculty of Science
- Martijn de Sterke, Faculty of Science
- Martin Tomitsch, The University of Sydney School of Architecture, Design and Planning
- Mary Tara Christie, Faculty of Science
- Maryanne Large, Faculty of Science
- Matthew Cleary, Faculty of Engineering
- Matthew Griffith, Faculty of Engineering
- Mehala Balamurali, Faculty of Engineering
- Michael Morris, Faculty of Medicine and Health
- Michael Kassiou, Faculty of Science
- Michael Seymour, The University of Sydney Business School
- Naseem Ahmadpour, The University of Sydney School of Architecture, Design and Planning
- Natalie Holmes, Faculty of Engineering
- Nicholas Hunt, Faculty of Medicine and Health
- Nicholas King, Faculty of Medicine and Health
- Nicholas Lawson, Faculty of Engineering
- Niels Quack, Faculty of Engineering
- Omid Kavehei, Faculty of Engineering
- Pegah Varamini, Faculty of Medicine and Health
- Penelope Crossley, The University of Sydney Law School
- Peter Bennett, Faculty of Science
- Peter Gill, Faculty of Science
- Peter Goodyear, Faculty of Arts and Social Sciences
- Peter Lay, Faculty of Science
- Peter Tuthill, Faculty of Science
- Philip Gale, Faculty of Science
- Philip Leong, Faculty of Engineering
- Ping Ma, Faculty of Engineering
- PJ Cullen, Faculty of Engineering
- Ralph Holz, Faculty of Engineering
- Renae Ryan, Faculty of Medicine and Health
- Richard de Dear, The University of Sydney School of Architecture, Design and Planning
- Richard Payne, Faculty of Science
- Robyn Jamieson, Faculty of Medicine and Health
- Ronald Clarke, Faculty of Science
- Rongkun Zheng, Faculty of Science
- Salah Sukkarieh, Faculty of Engineering
- Sandhya Clement, Faculty of Engineering
- Sandra Löschke, The University of Sydney School of Architecture, Design and Planning
- Sergio Leon-Saval, Faculty of Science

- Shelley Wickham, Faculty of Science
- Shumi Akhtar, The University of Sydney Business School
- Siegbert Schmid, Faculty of Science
- Simon de Graaf, Faculty of Science
- Simon Fleming, Faculty of Science
- Simon Kwok, Faculty of Arts and Social Sciences
- Sina Naficy, Faculty of Engineering
- Stefano Palomba, Faculty of Science
- Stephanie Watson, Faculty of Medicine and Health
- Stephen Bartlett, Faculty of Science
- Steven Maguire, The University of Sydney Business School
- Steven Wise, Faculty of Medicine and Health
- Susan Park, Faculty of Arts and Social Sciences
- Svetlana Postnova, Faculty of Science
- Thomas Grewal, Faculty of Medicine and Health
- Thomas Maschmeyer, Faculty of Science
- Tihana Divnic-Resnik, Faculty of Medicine and Health
- Tony Weiss, Faculty of Science
- Vera Chung, Faculty of Engineering
- Vesna Miletic, Faculty of Medicine and Health
- Vincent Gomes, Faculty of Engineering
- Wei Li, The University of Sydney Business School
- Wei Li, Faculty of Engineering
- Wojciech Chrzanowski, Faculty of Medicine and Health
- Xanthe Croot, Faculty of Science
- Xianghai An, Faculty of Engineering
- Xiaoke Yi, Faculty of Engineering
- Xiaozhou Liao, Faculty of Engineering
- Yi Shen, Faculty of Engineering
- Yi-Sheng Chen, Faculty of Engineering
- Yixiang Gan, Faculty of Engineering
- Yogambha Ramaswamy, Faculty of Engineering
- Yu Heng Lau, Faculty of Science
- Yuan Chen, Faculty of Engineering
- Zdenka Kuncic, Faculty of Science
- Zihuai Lin, Faculty of Engineering
- Zongwen Liu, Faculty of Engineering

## Successful Promotion Applications

### Level D:

- A/Prof Arnold Lining Ju
- A/Prof Arunima Malik
- A/Prof Justin Beardsley
- A/Prof Omid Kavehei
- A/Prof Zihuai Lin

### Level C:

- Dr Eugenia Gasparri
- Dr Michael Seymour
- Dr Moritz Merklein
- Dr Nicholas Hunt
- Dr Pegah Varamini

## Fellowships and Chairs

### ARC Future Fellowship

- Prof Jun Huang
- Prof Renae Ryan

### Academy of Science Fellowship

- Prof Albert Zomaya
- Prof Marcela Bilek

### International Association of Advanced Materials (IAAM) Fellowship

- Prof Hala Zreiqat AM

## Awards

### Order of Australia Medal

- Prof Stephanie Watson OAM

### ARC Centres of Excellence

- ARC Centre of Excellence for Carbon Science and Innovation - Prof Thomas Maschmeyer
- ARC Centre of Excellence for Green Electrochemical Transformation of Carbon Dioxide - Prof Yuan Chen and Dr Fengwang Li
- ARC Centre of Excellence in Optical Microcombs for Breakthrough Science - Prof Ben Eggleton and Prof Martijn de Sterke

### ARC LIEF Grants

- Prof Anita Ho-Baillie
- Prof Chris Ling
- Prof Michael Kassiou

### ARC 2023 Discovery Project Grants

- A/Prof Daniel Dias-da-Costa
- A/Prof Matthew Cleary
- Dr Matthew Griffith
- Dr Omid Kavehei
- Dr Svetlana Postnova
- Dr Yu Heng Lau

- Prof Alexander Broom
- Prof Brendan Kennedy
- Prof Chiara Neto
- Prof Chris Ling
- Prof PJ Cullen
- Prof Richard de Dear
- Prof Richard Payne
- Prof Susan Park
- Prof Xiaozhou Liao
- Prof Yuan Chen
- NHMRC Ideas Grants
- A/Prof Crag Jin
- A/Prof Stefano Palomba
- Dr Anusha Withana
- Dr Gurvinder Singh
- Dr Ling Zhu
- Prof Elizabeth New
- Prof Jun Huang
- Prof Margaret Sunde

#### SOAR Prizes 2023

- A/Prof Markus Muellner
- A/Prof Niels Quack
- Dr Fengwang Li
- Dr John Bartholomew
- Dr Katherine Kenny
- Dr Katherine Owens
- Dr Shelley Wickham

#### CUREator Grant

- Prof Michael Kassiou

#### Eureka Prize Winner for Interdisciplinary Research

- A/Prof Arunima Malik

#### Eureka Prize Finalist

- Prof Julie Cairney

#### Peter Andrews Award for Innovation in Medicinal Chemistry/Chemical Biology

- Prof Elizabeth New

#### ARC Discovery Early Career Researcher Awards

- A/Prof Arunima Malik
- Dr Yi Shen

#### Academic of the Year (Australian Defence Industry)

- Prof Ben Eggleton

#### Warren Prize, Royal Society of NSW

- Prof Anita Ho-Baillie

#### AFR Emerging Leader Award

- Prof Elizabeth New

#### Takreem Award for Scientific and Technological Achievement

- Prof Hala Zreiqat AM

#### Vice-Chancellor's Awards for Excellence 2022

- A/Prof Maryanne Large
- A/Prof Omid Kavehei
- A/Prof Penelope Crossley
- Prof Antonio Tricoli
- Prof Elizabeth New
- Prof Martin Tomitsch
- Prof Susan Park

#### 2022 NSW Young Tall Poppy

- Dr Matthew Griffith

#### Fulbright Postgraduate Scholarship

- Bryce Mullens

#### Student Innovation Award for Social Impact

- Olivia McRae

#### Clarivate Highly Cited Researchers

- Prof Albert Zomaya
- Prof Anita Ho-Baillie
- Prof PJ Cullen

#### Stanford University Highly Cited Researchers

- A/Prof Ahmad Jabbarzadeh
- Prof Ainsley Newson
- Prof Albert Zomaya
- Prof Ali Abbas
- Prof Andrew Doherty
- Prof Anita Ho-Baillie
- Prof Benjamin Eggleton
- A/Prof Boris Kuhlmeiy
- Prof Cameron Kepert
- Prof Catherine Stampfl
- Prof David McKenzie
- A/Prof Filip Braet
- Prof Iver Cairns
- Prof Julie Cairney
- Prof Marcela Bilek
- Prof Martijn de Sterke
- A/Prof Maryanne Large
- Prof Peter Goodyear
- Prof PJ Cullen
- Prof Richard de Dear
- Prof Salah Sukkarieh
- A/Prof Sergio Leon-Saval
- A/Prof Vincent Gomes
- Prof Yuan Chen

#### Sydney Nano TRL Booster Awards 2022

- Prof Marcela Bilek
- Dr Gurvinder Singh

#### Sydney Nano – MacDiarmid Joint Research Award

- Dr John Bartholomew

#### Sydney Nano – BINA Joint Research Award

- Prof Jun Huang

#### Sydney Nano ECR Support Fund (ESF)

- Dr Syamak Farajikhah
- Dr Yi-Sheng Chen
- Dr Taylor Szyszka
- Dr MD Arafat Mahmud
- Dr Jessie Posar
- Dr Qingbo Xia

#### Sydney Nano HDR Development Award (HDA)

- Chwenhaw Liao
- Jasneil Singh
- Jun Hong
- Queenie Yip
- Anyu Zhang
- Shaoxue Zeng
- Zhenxu Yang

#### Sydney Nano Publication Award

- Dr Anna Waterhouse
- Dr Chwenhaw Liao
- Dr Eugenia Gasparri
- Dr Hongjun Chen
- A/Prof Markus Muellner

#### Sydney Nano Picture of the Year Award

- Eva Li

#### Taste of Research Awards

- Esther Zhang
- Gweneth Masonsong
- Hongbin Luo
- Isabella O'Connor
- Joel Sved
- Justin Brown
- Miguel Campos
- Sofia Balingit

#### 2021 35 Innovators Under 35 of China

- Dr Fengwang Li

#### Top 100 Most Influential Ophthalmologists

- Prof Stephanie Watson

## All Events and Engagements

### Conferences, Public Lectures, and Global Summits

- CLEO Conference Plenary Lecture, 'Shaping the Wave: Achieving Success and Innovation Through a Diverse and Inclusive Workforce' by Prof Ben Eggleton
- Future Computing Symposium in partnership with the MacDiarmid Institute
- N4SN Global Summit – Sydney Satellite Event: Nanotechnology for a Healthier and Sustainable future
- N4SN Global Summit Launch: Nanotechnology for a Healthier and Sustainable Future
- Science communication through improv comedy, 'Lines of Best Fit', featuring Prof Stephanie Watson, Prof Anita Ho-Baillie, Dr Fengwang Li, A/Prof Girish Lakhwani, Prof Corinne Caillaud, and Zahra Lotfibalalani
- Solar Fuels Grand Challenge Symposium with Prof Anita Ho-Baillie and Dr Fengwang Li
- Third Australian Circular Economy (ACE) Conference Lecture, 'Circular supply chain in the built environment' featuring A/Prof Arunima Malik and Dr Ali Hadigheh
- University of Sydney Net Zero Initiative (NZI) Conference Lecture, 'Nanotechnology for a Net-zero future: Addressing grand challenges at nanoscale' featuring Dr Aysu Kuru, Dr Fengwang Li, Dr Arianna Brambilla, Prof Anita Ho-Baillie, Prof Deanna D'Alessandro, and A/Prof Nicholas Lawson
- University of Sydney Net Zero Initiative (NZI) Conference Lecture, 'Challenges in Hydrogen Economy: Safety, Transmission, and Storage' featuring Dr Yi-Sheng (Eason) Chen

### Distinguished Lectures

- Distinguished Professor Lidia Morawska, Queensland University of Technology, 'Why is clean air an unmet challenge, and will the pandemic help change this?'
- Distinguished Public Lecture Series featuring Prof Michael Sheetz, Prof Martin Chalfie, and Distinguished Prof Rong Li, in coordination with the 4th International Symposium on Mechanobiology (ISMB) 2022
- Dr Dan Daniel, Agency for Science, Research and Technology (A\*STAR), 'Slippery when wet: designing ultra-slippery, liquid-repellent surfaces for water-energy nexus and biomedical applications.'
- Prof Zuankai Wang, City University of Hong Kong, 'Nature-inspired surfaces for water-energy nexus'

### Future Leaders Program

- 'Intellectual Property and Commercialisation.' Presenter: Dr Stephen Lam
- 'Introduction to Research Integrity, Ethics, and Research Data Governance.' Presenters: Dr Rebecca Griffin, Dr Adele Haythornthwaite, Alan Hales, Nicole Clark
- 'Introduction to the Media.' Presenters: USyd Media and Public Relations Team
- 'Leadership.' Presenters: Prof Ben Eggleton, A/Prof Alice Motion, Rupal Ismin, Dr Gunther Schmidt
- 'Management.' Presenters: Peter Harrold, Dr Gunther Schmidt, Wendy Street
- 'Navigating Commercialisation.' Presenters: Sydney Knowledge Hub and Faculty of Medicine and Health – Research Enterprise and Partnership
- 'Research Communication.' Presenter: A/Prof Alice Motion
- 'Strategy Development, Principles and Tools.' Presenters: Rebecca Murray, Dr Gunther Schmidt
- 'Sustainable Development Goals.' Presenters: Moein Seyfour, Corinne Caillaud, Rosanne Quinell
- 'The Differences Working in Industry vs Academia.' Presenters: Dr Gunther Schmidt, A/Prof Maryanne Large, Liam Bray, Dr Caitlin Johnston
- 'The Multidisciplinarity of Nano.' Presenters: Prof Ben Eggleton, A/Prof Alice Motion
- 'User Centric Research: Design Thinking.' Presenters: Prof Martin Tomitsch, Adrian Wong

### Nanotechnology Innovation Workshops

- 'Can Quantum Computing accelerate the Hydrogen Economy?' Hosted by Prof Ben Eggleton
- 'Nanoscale solutions for sight in a changing global environment.' Presenters: Prof Stephanie Watson, Jude Stern, Prof Peter McCluskey, Mitasha Yu
- 'Net-Zero Building.' Presenters: Jeff Oatman, Hudson Worsley, Dr Arianna Brambilla, Dr Ali Hadigheh, Dr Alex Song, A/Prof Arunima Malik, Nicole Marchhart, Prof Nicole Gurrán, Gillian Graham-Crowe, Prof Ali Abbas
- 'World-leading Research Commercialisation.' Presenters: Prof Ali Abbas, Prof Julie Cairney, Natasha Rawlings, Sally-Ann Williams, Prof Salah Sukkarieh, Dr Mobin Nomvar, Rupal Ismin, Prof Ken-Tye Yong

### Other Workshops, Seminars, and Lectures

- Co-design workshop, 'Living Lab for Smart Sustainable Construction'
- Dewpoint Innovations Launch (spin-off from 2019 Grand Challenge 'Advanced Capture of Water from the Atmosphere', ACWA)
- Early-to-Mid-Career Researchers (EMCR) Launch. Hosted by A/Prof Yixiang Gan and Dr Nicholas Hunt
- Fireside chat by Prof Stephanie Watson, 'Clinician scientists at work: What do they do and how can they help you with research translation?'
- Meet the Author by Dr Fengwang Li, 'Catalysts and systems for CO<sub>2</sub> electrolysis'
- Sydney Nano 2.0 Leadership Showcase
- Sydney Nano and MacDiarmid Institute Workshop – Identifying overlapping themes
- Sydney Nano Annual Retreat
- Sydney Nano Micro/Nanofluidics Satellite Workshop in partnership with the Microfluidics Global Expo. Hosted by Dr Daniele Vigolo and A/Prof Stefano Palomba
- Sydney Nano Town Halls in June, September, and November

## Visits

- Ambassador Caroline Kennedy and Consul General Christine Elder
- BUSS4917: Advanced Studies Entrepreneurs, School of Business
- Clive Oates, Head of Region Americas and Five Eyes Nations, Surrey Satellite Technology Limited (SSTL) (Airbus Defence and Space)
- David Goodrich OAM, Executive Director, Silver Spirit Partners
- David Thodey, Chair of Xero
- Defence Acquisition Program Administration (DAPA) and The Republic of South Korean Agency for Defence Development (ADD) Delegates
- Dr Shane Arnott, Chief Engineer, Anduril Industries
- German-Australia Chamber of Industry and Commerce (GACIC) Health Cluster Delegation
- Greater Cities Commission (GCC), Transport for NSW (TfNSW), Transport Asset Holding Entity (TAHE)
- Heidelberg University Delegation
- Intelligence Advanced Research Projects Activity (IARPA) Delegates: Dr Catherine Marsh, Director; Dr John Beiler, Director Science and Technology/ODNI; Dr Pedro Espina, Director Office of Collections; Dr Dawson Cagle, Program Manager; Dr Michael Di Rosa, Program Manager
- Jeff Oatman, Head of Collaboration and Membership, Green Building Council of Australia
- Mark Bazzacco, Chief Operations of the Defence Science and Technology Group (DSTG)
- Matthias Seifert, Key Account Manager R&D Partnerships, Australia Pacific (Airbus Defence and Space)
- Physics Connect Students
- Professor Hugh Durrant-Whyte, NSW Chief Defence Scientist and Engineer
- Rio Tinto Centre for Mine Automation (RTCMA): Karl Malitz, Principal Advisor; Florian Oppolzer, Automation & Technology Growth Manager; Andrew Hill, Director of RTCMA; Kieran Parker, ACFR Business and Research Development Manager
- Sakal Educon 2022 Delegates
- Schmidt Futures - Quad Fellowship Delegates
- Senate Building and Estates Committee Members
- Tech Central Alliance Partners: Clover Moore, Lord Mayor; Darcy Byrne, Mayor, Inner West Council; Mark Scott, Vice Chancellor & Principal, University of Sydney; Glenn Wightwick, DVC Enterprise UTS; Teresa Anderson, CEO of the Sydney Local Health District; Hon. John Ajaka, Chair Sydney Local Health District Board
- The French National Centre for Scientific Research (CNRS): Dr Jean-Paul Toutain, Director of the CNRS representative office for Oceania; Camille Bitton, Scientific and Communication project manager
- The Hon. Alister Henskens, SC MP, Minister for Skills and Training, and Minister for Science, Innovation and Technology
- The Hon. Ed Husic MP, Shadow Minister for Industry and Innovation
- The Hon. Paul Fletcher MP, Shadow Minister for Digital Economy, Science and the Arts
- The MacDiarmid Institute for Advanced Materials and Nanotechnology
- Thomas Global Systems: William Hutchinson, Chairman; Andrew Hutchinson, Managing Director, Defence Australia; Nelson Mino, Director
- United States House & Senate Armed Services Committee
- Year 12 International Baccalaureate STEM Students

## Non-Traditional Research Outputs

- 'Atomic Choir', formed by the Nanosonic Stories Catalyst grant, performed at the Splendour in the Grass Science Tent in 2022
- 'Creatively processing the pandemic' is a multidisciplinary audio essay in which data from the COVID-19 pandemic has been translated into sound. This publication in ECHO (an online, open access, peer-reviewed journal) was led by our NanoResonance Catalyst node involving Dr Diana Chester, Dr Benjamin Carey, and Liam Bray
- 'Live from the Lab' connects scientists from the University of Sydney with musicians who then compose new pieces in response to the science. Hosted by A/Prof Alice Motion and played on FBi Radio
- 'Parsing the Pandemic' is a sound and visual work that explores the Johns Hopkins University Data on COVID-19 case numbers worldwide from 2020. This research team, Dr Diana Chester, Dr Benjamin Carey and Dr Luke Hespanhol, have developed this work through funding for data sonification and visualisation from the Sydney Nano NanoResonance Catalyst grant
- 'Sounding Out Science: The Sonaphor and Electronic Sound Design as a Learning Tool in Secondary Science.' Article published in Postdigital Science and Education by Alexis Weaver, Genevieve Firmer, Alice Motion, Jadey O'Regan, Chiara O'Reilly, and Daniel Yeadon
- Dr David Martinez Martin has been recognised by the World Intellectual Property Organisation (WIPO) for developing new technologies to improve understanding of cell development via effective and collaborative innovation ecosystems
- 'The wonders of plasma technologies for an aging population' by Dr Behnam Akhavan, published in The Chronicle of Higher Education

## Affiliated Publications

- Adamson, L. S. R., Tasneem, N., Andreas, M. P., Close, W., Jenner, E. N., Szyszka, T. N., Young, R., Cheah, L. C., Norman, A., MacDermott-Opeskin, H. I., Giessen, T. W., & Lau, Y. H. (2022). Pore structure controls stability and molecular flux in engineered protein cages. *Science Advances*, 8(5).
- Al Halawani, A., Mithieux, S. M., Yeo, G. C., Hosseini-Beheshti, E., & Weiss, A. S. (2022). Extracellular Vesicles: Interplay with the Extracellular Matrix and Modulated Cell Responses. *International Journal of Molecular Sciences*, 23(6).
- Ali, R., Balamurali, M., & Varamini, P. (2022). Deep Learning-Based Artificial Intelligence to Investigate Targeted Nanoparticles' Uptake in TNBC Cells. *International Journal of Molecular Sciences*, 23(24), 16070.
- Ardani, M. R., Pang, A. L., Pal, U., Zheng, R., Arsad, A., Hamzah, A. A., & Ahmadipour, M. (2022). Ultrasonic-assisted polyaniline-multiwall carbon nanotube photocatalyst for efficient photodegradation of organic pollutants. *Journal of Water Process Engineering*, 46.
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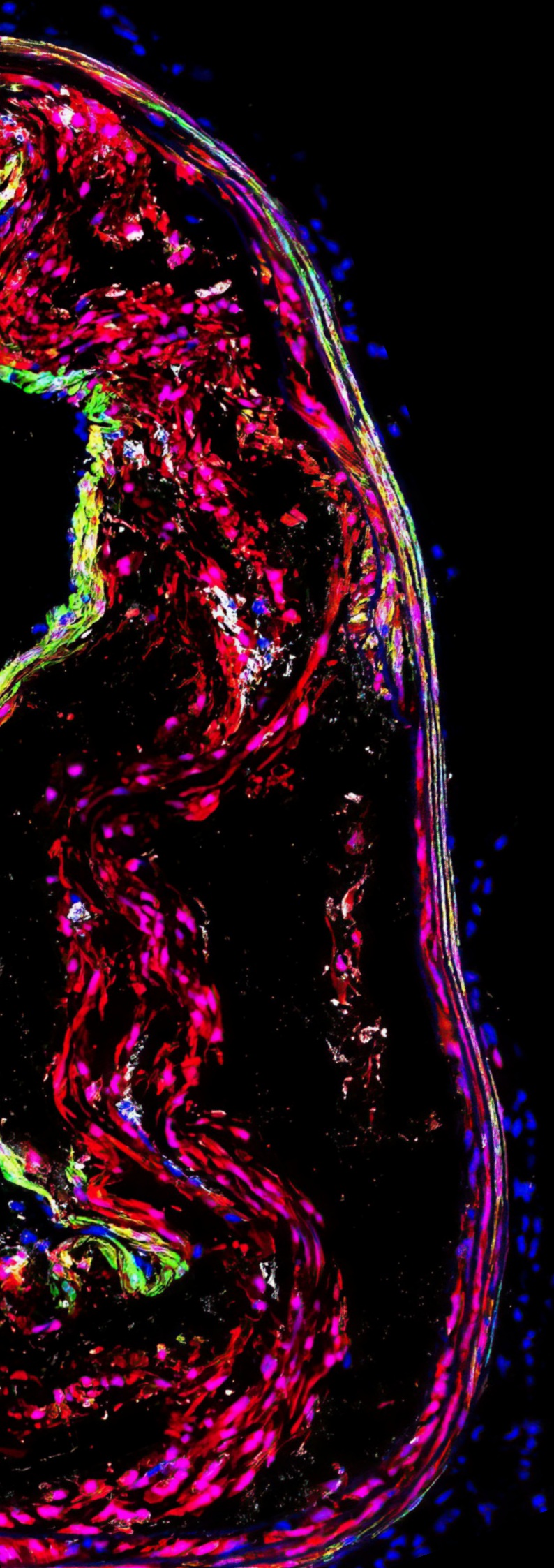
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